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ACCIDENTS FROM BROKEN BRIDGES.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE accidents from broken bridges in the United States in the last ten years are reported at 300, which, to say the least, is not flattering to American railway management. While it is certain that a considerable portion of these mishaps were purely accidental, it is a fact that the larger share of them might have been prevented by the exercise of ordinary precaution; and more correct views of true economy. Bridges have failed from being partially burned and not discovered in time, or from sudden freshets undermining their foundations, or from contraction of rods and bolts in severe weather, or some hidden defect in some member which had escaped the closest inspection. Such have been the causes of many accidents for which no one was responsible, and may be regarded as accidents or misfortunes that come in the common course of events, and cannot be prevented. But when a bridge fails from age or neglect, malconstruction, overloading, or any cause directly under control of the proper officials, who have the means of prevention at hand, it may not be regarded as accidental, but the result of incapacity, false economy, criminal neglect, or "cussedness," which is the proper word in most cases of bridge failures.

Probably one reason for so great a number of broken bridges is that they have been subjected to rougher treatment than they were originally designed for, and their factors of safety exceeded by a greatly increased weight of locomotives and car-loads. While within a few years the weight of locomotives has been more than doubled, and a standard car-load of ten tons increased to thirty tons or more, bridges have not been brought to a condition to carry these excessive loads; hence the numerous failures of these neglected structures. A great many roads were built for light traffic, and have since been leased by trunk lines that put on heavier rolling-stock and heavier trains than the cheap structures could bear, and it is not considered a sound policy to go into expensive repairs and renewals on leased roads.

It is the practice on some roads to renew bridges after a certain amount of service, though there are no apparent signs of weakness. This has more special reference to wooden structures, although engineers of the more carefully managed roads consider it the correct thing to renew iron bridges before any outward signs of weakness appear. To some of the slipshod economists this may appear like a reckless waste of earnings, but it is noticeable that this so-called kind of extravagance in expenditures leaves cash in the till, while the "guess-it-will-last-another-year-with-a-little-patching-up" management goes borrowing.

Scientists tell us of the "fatigue of metals," and practical men are well aware of the weakening effects of long

continued strains and vibrations, and expansions and contractions from heat and cold; and when iron bridges have reached a respectable age, there is much uneasiness felt in regard to their safety. The length of time an iron bridge can safely do duty varies from fifteen to twenty-five years, according to the quality of material, style or plan of construction, length, and amount of traffic, and location; extremes of heat and cold being destructive agents. At high temperature, when every member is expanded to its maximum length, a general screwing up is necessary for safety, and this tension, together with the powerful strain of contraction in severe weather, is the cause of many failures, not only of iron but of wooden bridges which are supported by iron rods. On the slacking and tightening of these rods at the proper time depends the safety of bridges in a great measure, and closer attention to this subject would have shortened the list of bridge accidents wonderfully.

Experiment has shown that a certain number of strains and vibrations crystallizes iron and steel, and when this takes place there is no longer any safety in the material. Cannons are condemned after a certain number of discharges, although they may appear sound; and on English roads locomotive parallel rods are thrown aside after six years of service, and cast car-wheels are considered unsafe after a certain mileage, and their use after that contributes largely to the causes that place roads into the hands of receivers. This applies to bridges, and it was a knowledge of this property of iron and steel that led a daily newspaper, a year or more since, in revenge for some fancied wrong on the part of the Manhattan Elevated Road, to injure the business of that road by warning the public that the entire structure was liable to fall to the pavements at any moment, by reason of crystallization and chronic weakness, engendered by a constant vibration for a period sufficient to render the entire fabric a mass of rottenness. According to this newspaper, there was not a train on the road that was safe for a moment, and it was only a question of a very short time when there would be a general smash, after the manner of the "wonderful one hoss shay." But Mr. R. J. Sloan, the chief engineer of maintenance of that great work, had anticipated the attack, and had been actively engaged for some time in adding strength to the structure, so that in reality the road was safer at the time the great calamity was predicted than at any time since its completion; and, under the present system of thorough inspection, and timely repairs and renewals, there is no safer place for a person than on any train on the "L" roads. The same practice would render bridges safe, and engineers will do well to "stick a pin there."

One suspected cause of bridge failures, especially of large structures, is a jealous rivalry among engineers. An engineer is placed in charge of a road on which his prede-

cessor has erected some bridges of his own design. The new-comer builds some after his plans, and, as they are pets of his and his friends, they are tenderly cared for in the minutest particular, that they may bring fame and fortune, while the others are left out in the cold uncared for, and signs of failure give the engineer a sort of pleasant anxiety, such as he would experience on hearing of the illness of a rich uncle. Just how many bridges have gone to destruction through this criminal neglect is not known, but it is certain that jealousy was the direct cause of the most horrible bridge disaster that ever occurred on this continent. A remote cause was a mixture of incapacity, malconstruction, and mulish stubbornness on the part of the originator and builder, a circumstance which the builder's successor sought to turn to his advantage. The engineer who had charge of the road at the time of the accident was well aware of the faulty construction, and knew very well what repairs and changes were necessary to render the bridge safe, but this he neglected from the first, and, later on, his attention was frequently called to needed repairs, which warnings were unheeded; and shortly before the crash he was informed that the bridge was actually unsafe, and required his immediate attention, and to this he paid no attention. When finally the crash came, he committed suicide, preferring death rather than face the censure that he knew was in store for him, and the prospect of conviction for wilful murder. It was clearly shown at the inquest that the bridges of his own construction were nursed and cared for in the slightest particular, and he could not face the evidence and the awful responsibility. Singularly enough, the designer and builder of the bridge committed suicide some years after the disaster. He completed the bridge in direct opposition to the advice of engineers of more experience than he in iron bridges, and it was a matter of dollars and conceit, braced up by a position which gave him authority, the abuse of which, and its results, literally worried him to death; and there is good reason to believe that other consciences are not clear on the score of strict attention to the safety of bridges.

It is frequently remarked that engineers should not be blamed for the failure of poorly constructed bridges, inasmuch as they are forced down to prices below which an honest bridge can be built, and they must employ shoddy material and make use of all the tricks known to the profession, or lose money. A few years since a large iron bridge on a New England road, broke down while under the initial test. The contract was awarded at a price far below what any reputable builder would undertake it for. In such instances—and they are not a few—everyone connected with the management should share in the blame. In the first place, no bids should be accepted below a price that would enable the builder to do a safe job, and in the next, no builder should undertake a job below a reasonable price. If he does, all are alike responsible for failures or accident, but if he is paid a full price and turns out a poor job, he alone is responsible for all damage resulting from his trickery.

Wooden bridges are less liable to fail from hidden defects in material than those of iron, except from the effects of age. Neither are they injured by vibrations to such an extent as iron, owing to the elasticity of wood when in a sound condition, but their strength is greatly impaired by

age, and, like iron, they are not safe without thorough repairs and timely renewals. Inspectors are frequently deceived by appearances in examining old wooden bridges, and outward appearances are not to be trusted. Timber that has been kept covered, and well protected with paint, will give no indications of decay on or near the surface, while, in boring to the center, dry rot may be discovered, and this is more to be feared than any other destructive agent. It lurks beneath a sound exterior, and can only be detected by boring, and should be frequently looked for. A little more vigilance and more sensible views of economy will shorten the list of bridge accidents.

RAILWAY LOCATION.

BY CHARLES SEYMOUR, C. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE question of locating a railway, so far as the engineer is concerned, is one of route in the field. Sometimes the main terminals only are defined by the projectors through their board of directors, when it devolves upon the engineer to present the merits of rival lines as to cost, length, alignment, grades and prospective traffic.

In order to study the country the engineer should make a careful personal examination of the different lines proposed or suggested, using freely all maps of the localities through which the lines pass that can be obtained, and such other information as he can secure from the residents of the country. He should determine the direction of main and secondary water-courses and ridges, and the location of all break-downs or depressions in the ridges that must necessarily be crossed, and also in those running parallel with line as sometimes it is expedient to cross from one valley into another running nearly parallel with it.

I have found it to be a good plan to ride over the country on horseback with a mountain barometer in my pocket, which is sometimes very useful, and accompanied by such citizens of the country as desire to act as pilots. New railways are popular, and plenty of volunteer pilots will be on hand, or men familiar with the county can be hired as guides. When the engineer has made himself familiar with the different probable routes, which can be done very rapidly with such aids as indicated, he will then be prepared to put a corps in the field and run his preliminary lines.

The first horseback reconnoissance will give the location of the important guiding points to run to, such as business centres, lowest gaps of ridges to be crossed, best river-crossings and valleys subject to least overflow, so that the engineer will be well prepared to act as pilot in the more minute instrumental locations, and he can keep the surveying party furnished with full instructions to enable them to prosecute their work intelligently and without any loss of time.

During the progress of the surveys, the engineer in charge should carefully study and examine the country for some considerable distance on each side of the line, so as to be prepared to run deviations that may invite attention.

All lines should be located with a view to the cheap working of trains, by obtaining ground that will admit of

the lowest grades and least curvature. If economy in construction is essential, it should be obtained by using temporary grades to save work, and pile or trestle structures to save the heavy cost of stone-work, but in no case should the true location be sacrificed for present economy as a railway when constructed is a fixture. If the location is not a sound one it is difficult to change afterwards. The additional expense is almost prohibitory, and interests developed by the railway would have to be sacrificed. If the location is all it should be, temporary grades can be reduced and timber can be substituted by stone and iron or steel.

I have found the compass the better instrument to use in preliminary work, as so much more ground can be gotten over in the time than with a transit. The transit has no advantage at all over the compass unless the preliminary lines are run with perfect accuracy. To do this, not much more than one mile can be made to two with the compass. With the same cash outlay, twice as much country can be instrumentally examined with the compass than with the transit, and the engineer is better prepared to select the true location.

NEEDED IMPROVEMENTS.

BY E. P. WILLIAMS.

[Written for the AMERICAN RAILROAD JOURNAL.]

AFTER a recent conversation with a director of one of the trunk lines, I made the following notes and suggestions which, I think, may be useful to the JOURNAL's readers.

IN putting the road in a proper condition a larger axle must be adopted, $3\frac{1}{2}$ inches being entirely too small. To this diameter one can easily trace the trouble they have with hot boxes. It would certainly be best to adopt a 4-inch journal, and make the axle long enough so that the plates of the cast-iron wheels may not be suddenly curved, to bring the tread into its proper place. Some persons will be surprised, no doubt, that the Master Car-Builders' Standard Axle is not recommended. The reason is not difficult to discover. When that axle was adopted it was a compromise. Many of the best men in the association thought the diameter of the journal then should have been four inches. Weights have increased since that time, and four-inch journals are more nearly correct than $3\frac{3}{4}$. The Master Car-Builders' Standard is much too small in the center, and is shorter than it should be for a cast-iron wheel of the best form. Finally, no two roads seem to have adopted precisely the same form of the Master Car-Builders' Standard Axle. As another standard will, no doubt, be proposed within a few years, the road may as well have the advantage of a large size, until the association make their new proposition. If the road adopts the 42-inch wheel for passenger equipment, it must have a large axle. The leverage exerted by these large wheels amounts, in some cases, to 25 per cent. more than that of the 33-inch. Several years ago, Mr. Garey, when president of the Car-Builders' Association, found that the standard axle bent in the middle, under an ordinary load, so that the wheels spread at the top. If the axle was too weak for the 33-inch wheel, something stronger is needed for a 42-inch.

I think we should remember, in regard to all the stand-

ards, that they are only a means to enable roads to conduct their business with economy. When they hinder progress, or stand in the way of efficiency, they had better be quietly ignored. Standards are very valuable, but they are not often found to be sufficiently accurate in practice to enable interchange to be made by a number of roads. It is best to have the proposed standards carefully investigated by the master car-builder. If there are discrepancies reported, it is certain that some point has been overlooked.

The Master Car-Builders' Association proposed a standard wheel-tread at their last session. A wheel made after this pattern, could not be put on an axle and made to conform to the other standards which they had already adopted. This was evident to every experienced man, and the wheel was rejected. The proposed form was good but could not be adopted till some of their absurd standards had been changed. On this account I would advise a careful investigation to be made of every standard proposed, before considering the question of adoption.

The standard house or box-car is not worth a moment's thought on the part of the management of the road. I believe we are on the eve of a revolution in freight-car building, and to attempt the introduction of a new standard, to which no one will adhere, is a waste of time. The coming freight-car will be of iron or steel. If the gas-wells do not fail it will be built in Pittsburgh. We need not trouble ourselves about its pattern, for that must be decided by the convenience of manufacture to a large extent. I expect, at some time, to buy my cars as I do my wheel-barrows. I shall select, from the styles offered, those that suit my needs and are cheapest, and then shall have no further care in the matter.

I have on my road a few of those passenger-cars with the spliced sills, and I confess I feel anxious every time I see one go out on a train. I asked one of my young men to figure up as nearly as possible the actual strength of one of the "ship splices" used on them. He could not estimate the stiffness very accurately, but found, by measurement, that fully half of the effective area of the timber was destroyed in making one. The cars of that build, which have gone into accidents within the last year, have been destroyed in a manner which convinces me that they have no strength in the floor frame. The builders never discovered that a spliced sill was better than a single stick till long cars were called for, and long sticks grew scarce. It is the increase of price for the long sills that makes the contract-builders such strong advocates of splicing.

When cars are ordered, specify single sticks for the sills, and have the master car-builder at the works to see that single sticks, sound, free from sap and shooks, are put in. With spliced sills, these long, heavy parlor-cars will have to be carried by the truss-rods, and will have no margin of safety. They are liable to be broken if the cars run off the track in the yard at any considerable speed. Could give chapter and verse if it was necessary.

In buying sills, my rule is to get what are needed for the passenger and baggage-cars, and then pay for them like a little man afterwards. Mr. Watrous, of the New Haven road, can give most railroad men points on this. There is no difficulty in getting sticks of sufficient size and length, free from sap, knots, and shooks. The trouble

that is met comes from the fact that people are afraid of the price. It makes very little difference whether one pays \$45 or \$65 per thousand for the six most important timbers in a passenger-car. If one must practice economy on the lumber bill, do it at some less vital point. The difference between the very best and very common sills will not at the present time amount to more than \$50 per car, and at some shipping points it is even less. This is too small to be worth saving at the expense of the strength of the car, and possibly human life.

SUBURBAN TRAFFIC.

ONE great requisite to a successful handling of this class of business is properly designed and constructed motive-power. It is required of an engine for suburban business that it shall be able to pick up its train promptly, and get under full headway within a short time and distance from leaving a station. Without this ability there is too much loss of time in the numerous stops which are necessary. The engine, to accomplish this, should not be heavier than the traffic demands, the smaller engines, as a rule, being quicker in getting under full headway; and it should have a valve motion which will give the freest action of the steam in the cylinders. A sufficient weight is needed on the drivers to prevent slipping, and this can be well accomplished by some form of a tank engine. It is also desirable that the engine should be constructed to run equally well in either direction, so to avoid the necessity of turning. This is an important point in view of the short time allowed for handling suburban trains at terminal stations. The arrangements for combustion and the fuel used should be such that the least trouble would be experienced from sparks or smoke. We have seen many engines in use, at various places, which fully meet all the requirements noted above. In the desire, however, to obtain economical engine service, we should avoid using too small or too light engines. We have heard of this fault in places where otherwise the service seemed all that could be desired, and it can be readily seen that such faults result in loss of time and increased expense in handling the train.

The cars are the next important consideration, and upon their construction depends much of the comfort of suburban patrons. The full requirements for successful operation seem to be met by the cars running from several of our large cities, but a sketch of the requirements may not be amiss. The cars should be a slight as possible, consistent with strength and safety. A lighter construction may safely be used with such cars, as they do not make long trips away from home, as in the case of ordinary coaches, and they are not exposed to the longitudinal strains from the heavy sleeping-cars and long trains of the through traffic. The lighter cars also allow of the prompt handling of trains needed in this class of business. The cars for this traffic should be well lighted both by day and night, so that newspaper reading, so dear to the American mind, can be easily carried on. The heating should be ample, as the frequent stops necessitate much opening of doors. The inside finish should be light in color, simple in character and of such a nature as to allow of quick and thorough cleaning of the cars. With this class of car, convenience and neatness is more called for than elabor-

ation of ornament or lavish expense. The arrangement of seats should be such that the car can be filled or emptied in the shortest possible time, thus shortening the stops at stations.

The stations should also be arranged so that the passengers will be protected from the weather, whether entering or leaving the cars. A certain amount of taste in the arrangement and ornamentation of stations adds to the comfort of the patrons of the road, and aids in building up its business as against towns situated on other lines.

The lighter rolling-stock used for suburban business allows of a larger percentage of paying load to dead weight than can be reached in the passenger-trains in ordinary local or through traffic. This percentage, with good handling of such traffic, can probably be made fully twice that of ordinary trains. On the other hand, it is not well to try to carry this proportion too far by carrying an extra large number of cars to one engine. Such a train becomes unwieldy and hard to start and stop. There is another argument against long trains in suburban service, and that is the difficulty with which the conductor can get from end to end of the train, so as to collect all fares between the frequent stops made. The loss of revenue from this source may be considerable in amount, though perhaps not in percentage of the total amount collected. When all fares are paid before entering the cars and the tickets taken by gatekeepers this difficulty is somewhat obviated. It seems to us, however, that all things considered, five cars, each capable of seating as many passengers as an ordinary coach, make about the size of train that can be handled most efficiently, comfortably and economically in all respects. In addition to the gain from heavier relative loads the cheaper and lighter style of car resulting in lighter trains gives to a certain extent less expense for engine, car and track repairs.

There is also a certain amount of saving, as we have before remarked, because of the freedom from soliciting and advertising expense, which forms so important a factor in the through business. As regards station or terminal expense, there is probably as large an amount incurred for the same quantity of suburban travel as for the regular passenger business. The numerous details involved through the wants of a large suburban constituency necessitate much petty work on the part of officials, and considerable storage and waiting-room at stations. Other items of total operating expenses are probably not much affected by handling suburban business, except that if such a business can be built up without injuring the strictly local traffic there is a larger number of travelers who will help reduce the general or fixed expenses on other passenger business.

In order to encourage new business on a suburban line, and to develop the growing villages on the outskirts of a large city, a road has to do a certain amount of what might be called "pioneer work" in running trains and furnishing station facilities in advance of what seem to be the actual needs of the district traversed. Such pioneer work has, of course, to be entered into with much judgment to avoid any expense that may not result in future gain, but there is no doubt that a certain amount of this sort of encouragement is necessary and has in the past been attended with good results.

Another important feature which concerns the comfort and economy of those living in the suburbs of a large city, is some complete system of what might be called a parcel express by which the transfer of ordinary packages between the town and country stations can be done cheaply and promptly. While suburban residents can often get country products cheaper and fresher than in town, a large city offers numerous advantages in the way of purchasing which can not be possessed by any suburb. While on one hand it is not advisable for the road to discourage the carrying of hand-packages by passengers as long as the comfort of others is not disturbed, yet, on the other hand, there is a large amount of traffic to suburban stations that must of necessity go in the baggage-car. While the policy of the road should be liberal in this direction there seems no reason that patrons should expect to have their purchases carried free.

Some system can easily be devised by which articles left at either the country or city depots will be carried and cared for at low rates which would yet bring in a certain amount of revenue to the road. Some arrangement should be in force by which packages could be received from or delivered to the houses and stores at the country town. In the city there are existing arrangements for doing this. The average suburban resident has generally moved out of town on the score of economy and as a rule does not possess a team of his own, so that some cheap means of getting packages to and from the station is a necessity. When the railroad has a contract with an express company for its regular parcel traffic this suburban business, including deliveries at both ends, can be handled well by the express company. The railroad managers should see, however, that liberal rates are allowed their suburban patrons and that collecting and delivering facilities are as perfect as possible. The parcel feature of suburban business has reached a very complete shape in England and forms no inconsiderable portion of the service of the roads.

The question has been raised whether these liberal facilities for parcel traffic would not hurt the prospects of local stores in the villages on the suburban lines. While there are always items of daily supply which are constantly needed at short notice, there will also always be a need for stores of some magnitude in the suburban stations. It is an impossibility, however, for them to expect to supply the total wants of suburban residents, as the proximity of a large city always interferes with the development of ordinary stores in the adjoining towns. While a road, by discouraging the parcel traffic, may, to some extent, aid the local stores, the best interests of the many will be served by the extension of the best facilities for obtaining needed supplies in the city. If the country store is able to offer equal inducements, either in prices or quality, the convenience of near supply will generally give it a fair trade, regardless of the city competition.

The wants of suburban business, and the various features to be considered in its successful development, both as regards profit to the road and the comfort of its patrons, make this class of traffic to a large extent a distinct branch of the service. The features of both passenger and freight traffic of this nature vary in many respects from the ordinary traffic of the road, and need dif-

ferent handling, to a certain extent. Where this class of business is of large proportions on any line, it is questionable whether a separate officer or department to take immediate charge of the traffic is not advisable and necessary. Such an official has been appointed in some cases and the results arrived at are quite gratifying. Whether this is done or not, it seems evident that the question of suburban traffic is daily becoming more important with the growth of our western cities, and will demand more attention from the management of our roads.—*Railway Review.*

RAILWAY REGULATION IN ENGLAND.

THE introduction of a new scheme of railway regulation in the British House of Commons, within the month, is an event deserving of more than a passing remark. It goes to show that, in spite of an impression to the contrary long prevalent here, perplexing questions of railroad policy have not ceased to exist in England, and that further intervention by the state is now felt to be necessary for the settlement of vexatious controversies. Measures of this kind are not new in England. As long ago as 1840-42, the Board of Trade was authorized to exercise certain powers now usually devolved on railroad commissions. In 1846 a railroad commission was appointed which continued in office for five years, but its powers were too limited and it left little mark. During the forty years that have elapsed since then measures of railway regulation have been frequent. The law establishing the existing railway commission was passed in 1873. The commission was to consist of three members, of whom one was to be a railroad man and one a lawyer. It was authorized among other things to decide questions arising under the railway regulation acts, to arbitrate between railroads in a variety of cases, and to secure publicity of rates. On questions of fact there was to be no appeal from the decision of the commission; an appeal was given on questions of law. The authority of the commission expired by limitation in 1878, but it has since been renewed. High hopes were entertained of the commission, and the expectation that its existence would of itself put an end to the most perplexing questions seemed to be borne out by its reports, but observers who looked beneath the surface became aware of the existence of difficulties which the powers of the commission were not able to reach. The commission, as an acute American critic, Prof. Hadley, has pointed out, "was not an executive body, but to all intents and purposes a court of law," and a court, too, whose action was not final. The railroad men seized upon this point of weakness, and by a course of persistent appeals did much to neutralize the commission's action by deterring complainants. These facts were brought out by a parliamentary investigation in 1881-82, and since the publication of the result of this inquiry the project of the increasing powers of the commission has been brought forward from time to time.

Under the plan submitted by Mr. Mundella, the president of the Board of Trade, the railroad commission is made a permanent court of record, whose decision on matters of fact is to be final, but from whose decision on questions of law an appeal will lie to a court of appeal. The place of chief commissioner is to be filled in England

by a judge of the High Court of Justice, in Scotland and Ireland by judges of a corresponding grade. The other two members are to be laymen. Every order of the commissioners is to have the force of a judgment. The jurisdiction of the commissioners is to extend to all questions respecting tolls, rates or fares, and they are to be given power to award damages. The constitution of the commission, it will be seen, retains many points of resemblance to that of the present one, though the powers of the new commission are more extended. The bill requires all railroad companies to furnish the Board of Trade from time to time with a statement of their rates and charges, together with a schedule of maximum rates, and a statement of the nature and grounds of the terminal charges proposed. Public inquiry will be made regarding the existence of any dissatisfaction with the companies' proposals, and where substantial grievances are proven the schedules will be revised by the board under the control of Parliament. Where unequal charges are shown to exist the companies may be called upon to show that the inequalities are justified. A novel feature of the bill is the attempt to make of the Board of Trade a sort of mediating body by providing that where complaint is made to the board of unfair or unreasonable charges, that body may strive to settle disputes amicably. Mr. Mundella laid much stress on the importance of negotiation and arbitration in the settlement of railroad disputes, and particularly referred to the experience of the United States as illustrating the advisability of mediation. Upon this point the president of the Board of Trade quoted *Bradstreet's* as showing that success has attended the efforts of the railroad commissioners to bring the railways and the people together in friendly discussion. There is nothing, he thinks, to which the railroads are so amenable in America as public opinion, and he hopes that the same will be proved to be the case in England.

There has been, naturally, some criticism as to the merits of certain features of the bill, but as a whole the measure seems to have the support of those best qualified to speak on the subject. Sir Bernhard Samuelson, a specialist on the subject of railway rates, is quoted as saying that under the bill "there is promise that the grievances of those interested in railway rates will be remedied." There can be no doubt, at any rate, that under the proposed law the railroad commission will be stronger in itself, and will have freer hand to carry out its purposes than at present. Under the proposed law the commission, instead of having a precarious tenure dependent upon renewals for short periods, will be a permanent body, thus gaining in stability and dignity. It will have power to move about the country, so that the barrier of inconvenience will not operate to shut out complaints. Beyond this the power of revising schedules of rates is secured to the Board of Trade under the control of Parliament. This is a power which, though often claimed, has been but rarely and very sparingly exercised. It is one too, in the exercise of which the greatest care and circumspection will be necessary. Lastly, there is the machinery for securing publicity in respect to rates and charges, and in reference to the recommendations made by the Board of Trade as a mediator in cases of dispute. It cannot be doubted that the existence of this machinery will in many cases render unnecessary the exercise of the other powers

of the commission, and will in itself go far to do away with many of the abuses which the new measure is designed to reach.—*Bradstreet's*.

Railways in China.

THE House Committee on Foreign Affairs recently received from Secretary Bayard the following letter from Minister Denby relating to the effect of the annexation of Burmah and the establishment of overland routes to China in relation to the building of railways:

The annexation of Burmah by Great Britain gives new interest to the railway question in the Far East and the establishment of overland trade routes with China.

Three great European nations have been gradually carrying their frontiers nearer to China. Russia has been pressing forward from the north and west by annexing the banks of the Ameer and a large portion of Kirin, which makes her conterminous with Corea, on which latter country she is also supposed to have designs, and by the position she holds at Kashgar and at several other points in the west of the new dominion.

France comes next in the field from the south, and hopes that she may establish her supremacy in Tonquin, and open to her commerce the Red river and acquire the trade of Western China.

England, which seemed the last in the field, has by a bold stroke of policy assumed the foremost place, and acquired, by the annexation of Burmah, the only trade route existing between Southern Asia and China—viz.: the Irrawaddy and Bhamo route, and makes still more probable the eventual building of a railroad connecting British India and China.

Russia, in the meanwhile, is pushing on, at the rate of several miles a day, her Central Asian railways, which will shortly reach Merv, and in the near future Kuldja, thus greatly facilitating the defence of her immense frontier. But the project which concerns her ultimate prosperity most nearly is the system of Central Asian railways designed by M. de Lesseps. This line, destined to unite the extreme west of Asia with the extreme east, starts from Astrakhan, passes through Khiva, Bokhara, and Samarcand into Chinese Turkestan; touches at Tang-Kissar, Kashgar, and Yarkand; skirts Lake Lob, and thence through outer Kansule, down to the Kan Valley, to find its terminus in Wuchang or Kankow. The military railways already established or in construction by Russia are partly carrying out this gigantic scheme, and if the words of Tso Tsung Tang on the pressing necessity for China to establish in the near future a railway to her northwestern frontier be borne in mind by China, a colossal railway system may be established sooner than we expect.

In this connection it may interest the department to know that Gen. James H. Wilson, who, at the request of Li Kung Chang, has been examining the country near Tien-Tsin in view of the ultimate establishment of railway communications, left for Chinkiang, by way of the Grand Canal, to report on the practicability and cost of a railway along this line, and also on the condition and necessary work to be undertaken to control the Yellow river. Gen. Wilson has with him several able surveyors, and was offered a military escort by the Viceroy, which he, however, declined.

Coal in India.

It appears, as shown in an official statement lately published in India, on that country's moral and material progress that the use of Bengal coal, which is general in that province for industrial purposes, is gradually extending throughout Northern India. Bombay continues to draw its support from England, the freights for English coal sent out in exchange for cargoes of raw produce ruling very low. But with the extension of railways and the reduction of freights in the coasting trade, India coal may, it is stated, before long compete successfully with imported coal, even in the Western Presidency. In Bengal, only three out of the numerous coal fields known are actually worked, the principal of which is the Raniganj. There are seventy-eight collieries, and the total out-put was, in 1883-84, 1,200,957 tons, or more than double the out-put, 532,846 tons, of 1882-83. Outside Bengal there are only two collieries, those of Mohpani and Warora, in the Central Provinces, though it is stated that workings were begun in the native State of Rewah, toward the close of the official year. An attempt to open a mine at Lakading, in Assam, has also recently failed. The Assam coal fields, however, which have just been prospected, are considered very promising. They cover a plateau with an area of thirty square miles. The number of people engaged in mining in India is something over 23,000, but the return is admittedly inaccurate. Iron has been found in almost every district in India, and is worked with charcoal by native agency. It is expected that the growing scarcity of fuel and the competition of English iron will displace the indigenous methods by European manufacture on a large scale. This has not yet occurred. The chief native foundries are in Bengal, the Punjab, and the Central Provinces.

American Locomotives vs. European.

In a letter to the Department of State published in the Consular Report for January, the United States Consul at Chemnitz, Saxony, says:

"Recently the Roumanian Government invited bids for contracts to furnish 212 passenger-coaches, thirty tender-engines, and twelve express-train engines, together with more than 300 freight-cars, and other rolling-stock for railways. There were many bids, from various parts of Europe. I do not know whether those engaged in this industry in the United States were apprised of this or not, but I do know the superiority of American rolling-stock, and regret to say that there was no effort put forth from the United States to supply the Roumanian Government with these articles.

"It is my firm belief that, with a little effort on our part, these contracts might have fallen to the United States; as it was they have been secured by the vigilant and wide-awake Germans, who have captured *en bloc*. The contract for the engines was awarded to the Hanoversche Maschinenbau-Gesellschaft, at the price of 1.14 francs gold per kilogram of metal used. At this rate the price of a tender-engine would be about 24,000 francs in gold, or more than \$4,000. The locomotives to be delivered at Bucharest. The contract for the twelve express engines fell to the Maschinenfabrik Linden, of Hanover, at 47,200 francs,

and the contract for the freight-cars was awarded the Deutz firm, of Zypen & Charlier, the bid being 550,000 francs, the highest being 880,012 francs.

"Americans must not judge of their ability to compete with others in such articles by the price I have quoted here. The question with them would be if they could get a better price for a superior article, and I am strongly of the opinion that this question would have been decided in their favor. Why should it not have been, when Russia, Roumania's next-door neighbor, has adopted the American railway system, and has equipped her railways with American rolling-stock, which has proven in every respect in the highest degree satisfactory to the authorities; or in a contract of this kind, the elegant finish and trim appearance of the American locomotive, which is strongly appreciated in the United States, might have been abandoned and the European taste, or rather want of taste, catered to?

For example, a European locomotive has no cow-catcher; many of them have no jacket, and many have no cap, and there are many other appurtenances to an American locomotive that would be considered superfluous for a European or Roumanian, that would reduce the cost of their construction for this country from 7 to 10 per cent. less than that would be required for one of our railways. I hope it is not yet too late for Americans to give this subject their attention, and that they will lose no time in doing so. Of one thing they may be sure, and that is that they have the strong claim of superiority for their machinery and rolling-stock, which they can easily establish, and which is the best they could have to overcome competition.

Second-Class in England.

THE Liverpool *Post* says: The second-class traveler on English railways is gradually being improved out of existence, or, to put it more accurately, third-class traveling has been made so exceedingly comfortable, snug, and expeditious that it is rapidly monopolizing all the business. First-class compartments there will always be, but their patrons will remain few. The compartments designed for the middle-class of the traveling public have been entirely eliminated on one of our main trunk lines, and they are fast disappearing on another. The Great Northern is following the example of the Midland. It is announced that with the new year the first named company will cease to issue second-class tickets between their stations in the West Riding, and between those and Doncaster. On the main line second-class accommodation will still be provided, as it will also be between stations in Yorkshire and stations on the main lines south of Doncaster. This change has already been effected in other parts of the Great Northern system. On the first of May last, the company ceased to issue second-class tickets to the Lincolnshire loop lines, and between Grantham and Boston, Bourne and Spaulding, Grantham, Nottingham and Derby, and Newark and Leicester. The reason for this extinction of the second-class traveling accommodation is not far to seek. It does not pay the companies to run carriages which are never filled, unless it be with emptiness. It is the once despised third-class traveler who is now the paying feature in the passenger returns. Twenty years ago no treatment was too bad for those who had the temerity

or courage to venture to book themselves third-class. To-day the third-class passenger is an object of profit, and he gets all in the way of comfort and celerity that he can possibly desire. If he is badly treated anywhere, it is in remote districts where competition is absent, and where railway directors have not yet learned to treat with respect and consideration the most profitable of their customers. The old taunt heard in Germany that only princes, Englishmen and fools travel first and second-class can hardly apply to the modern Britisher, who has been quite content to follow the revolution in management which tends so thoroughly to break down class prejudice.

Railways in Spain.

THE aggregate revenue of the Northern of Spain to February 25th, this year, amounted to £297,752, as compared with £323,646 in the corresponding period of 1885, showing a decrease of £25,894 this year. The aggregate revenue of the Lerida, Reus, and Tarragona (which is worked in association with the Northern of Spain) to February 25th, this year, was £9,236, as compared with £10,766 in the corresponding period of 1885, showing a decrease of £1,530 this year. The aggregate revenue of the Asturias, Galicia, and Leon (which is also worked in association with the Northern of Spain) to February 25th, this year, amounted to £43,940, as compared with £36,438 in the corresponding period of 1885, showing an increase of £7,502 this year.

Indian Territorial Railways.

As appears by a late issue of the *Boston Transcript*, there are pending in this congress nine propositions to grant railroads right-of-way through the Indian territory, of which about half are in the interest of Boston capitalists. The Kansas City, Fort Scott and Gulf desires to run across the northeast corner of the territory, entering the forbidden country just south of Baxter Springs, in Kansas, and pursuing a favorable route to Fort Smith. The Kansas and Arkansas Valley wishes to enter at Fort Smith and extend in a northwesterly direction to Arkansas City. The proposed route of the Wichita and Arkansas Valley is from a point near Lisbon, in Chautauqua county, Kan., in a southerly direction, along the general course of the Caney river, to near its junction with the Verdigris; thence southeasterly to Fort Gibson; thence to the boundary of the territory, near where the Arkansas river crosses into the State of Arkansas. The Southern Kansas, if its bill passes, will enter the territory near Arkansas City, and follow a practicable route to Fort Smith. The company binds itself to build one hundred miles within three years, and it further binds itself to observe strict neutrality on all questions or movements looking to the extinguishment of the Indian titles. The St. Louis and San Francisco right-of-way bill is already so far on its way that it is almost as good as passed. This bill authorizes a route through the Choctaw and Chickasaw nations, from Fort Smith, in the direction of Paris, Tex. John Scullin's road, the Denison and Wichita, is to be constructed from near Denison, Tex., across the Indian territory in a northeasterly direction until it strikes the Frisco's Paris route. The Pacific and Great Eastern contemplates a line from near the town of Cincinnati, in Washington county, Ark.,

due west through the entire length of the Indian territory, emerging near the thirty-sixth parallel of latitude. The Fort Worth and Denver City wishes to extend northward across the territory to the southern boundary of Kansas, entering the territory somewhere near the mouth of Big Beaver creek and the mouth of the north fork of the Red river. The St. Louis, Baxter Springs and Mexico wishes to get in near Baxter Springs and build south to the Texas boundary, with a branch extending to the western boundary of the territory.

Trees Along Railways.

AT this time the subject of protecting railway cuts from the possibility of being filled with snow should attract the special attention of managers, says a correspondent in the *Farmer's Review*. In riding over thousands of miles of Russian railways in 1882, I was struck with the perfection of their system of shrub and tree planting to arrest snow at all points where banks could possibly form. I was told the system had proven a success in that land of blizzards, deep snows, and frequent and deep cuts on the rolling prairies.

Mr. G. Doppelmaier, of Kiev, Russia, who has given much time to this kind of work, writes as follows: "The trees for arresting snow are planted 25 to 30 feet from the rails, in 5 to 7 lines. Lines 5 feet apart and the plants 1½ feet apart in the rows. The three inner lines are planted with trees, and the outer ones with conifers, or shrubs.

"This system of planting protects very perfectly our roads during the gales on the steppes. The snow is whirled in heaps back of and among the trees and shrubs, and fails to reach the rails to a serious extent."

In the west, box elder will make the best tree for the center rows, and the outer rows can be made of such conifers as do well on high ground in different parts of the west. *Pinus pumilio* is much used in Russia, as it keeps low and bushy. It will grow here in any dry soil as perfectly as in Russia. If larger growing conifers are used they can easily be kept down by shearing. In Russia the shrubby carayana is much used for outer rows. It is perfected hardy here, and will grow on the driest knobs. If desired to plant along our roads the seed can be imported at very low rates.

Pullman Sleeping-Car Employes.

THE Pullman company has recently framed an "iron clad contract" for its employes to sign, releasing the company from obligation to them in case of accident. It provides among other things, as follows:

"That I may be suspended, definitely or indefinitely, with or without pay, or be discharged from such employment and service at the pleasure of the Pullman company, or at the pleasure of any general, division, or assistant superintendent, or authorized agent thereof, at any time without previous notice, such notice being thereby expressly waived.

"That in consideration of such employment and service, and the payment to me of the wages or salary now or hereafter agreed upon, and as a part of the agreement for such employment and service and the payment of such wages or salary, I hereby undertake and bind myself to

assume all risks of casualties by railway travel or otherwise, incident to such employment and service, and accordingly hereby release, acquit and discharge the Pullman company from any and all claims for liability of every nature and character whatever, to me or my heirs, executors, administrators or legal representatives on account of personal injuries or otherwise."

The other clauses make it necessary for the employé to bind himself to obey the rules and regulations of the railway companies over which the Pullman cars are operated, and in consideration of free transportation if injured acquits and discharges the railway company from liability, etc.

Locomotive-Cars.

RAILWAY operating in Trans-Caspian Russia is beset with difficulties unknown to other regions where railways are used as a means of travel. A great portion of some roads are entirely waterless, there is no traffic except through traffic, and at certain seasons of the year the cold is intense, and the absence of local fuel supply renders heating and steam-making very expensive. To meet these untoward conditions, the Russian Government, which operates the railways, is having a special type of combined locomotive-car built that carries enough water to run seventy miles. From the description we have seen, we believe the locomotive-car is an enlargement of the American observation locomotive illustrated in the *National Car-Builders* of November, 1884, with modifications to suit the practice of Russian railways. There are six of these locomotive-cars under construction at Kolomna. It is expected that, owing to their lightness and compactness, they will make the desert journey quicker, cheaper, and more comfortably than the ordinary train. The exhaust-steam will be used to heat the car, and the engine will have sufficient power to pull two freight-cars, or a passenger-car, when necessary. We believe a tank-car locomotive of this description could be used to good advantage on many of our branch roads where traffic is light.

Longevity of English Engines.

ENGLISH engineers are giving no small degree of attention to the durability of their locomotives. The statistical details should be out in book form and preserved, as they will become interesting as the competition between the American and English type of engine increases. Mr. Johnson, of the Midland Railway, confines himself to breakdowns. In 1885 there were 60 cases in which an engine was rendered idle for half a day or more. Among the causes was the breakage of crank and straight axles, slide valves, and valve spindles through wear and tear; also cases of hot guide-bars, due to neglect on the part of drivers; and cases where drivers had to give up their trains. The gross engine mileage for 1885 was 43,657,427. The total number of engines, 1,803. The average mileage, supposing all the engines to have been worked, 24,200. There was one breakdown for every 727,624 miles. This includes engines of all kinds. Portions of the line are exceptionally heavy, and the trains run are the heaviest and fastest in the world.

The Carrying Capacity of Cars.

TEN years ago, remarks an exchange, a standard car load on all first-class railways was 20,000 pounds, the weight of the car being 20,500 pounds. In 1881 the load on most roads had increased to only 22,000 pounds. The master car-builders of the Pennsylvania Railroad have now adopted cars to carry 60,000 pounds, while the weight of the cars will be very little increased. Instead of hauling more than one pound of car to one pound of freight nearly three pounds of freight can now be hauled for one pound of car.

The substitution of steel for iron rails has made change possible. The condition of affairs makes it possible for the roads to carry freight at the low rates they receive, and yet make a profit.

A Caustic Soda Locomotive.

ACCORDING to the *National Car and Locomotive Builder* a company has been formed in Chicago to introduce the Honigmann fireless motor for the operating of street-railways, and for other purposes where steam-motors are objectionable, and where the work is a weariness to horse-flesh. A motor weighing about four tons was imported from Germany, and it has been tried on the Chicago City Passenger Railway Company's tracks; but it was found deficient in tractive-power, and could not climb the steep approaches to the river bridges. It has now been taken to Minneapolis, and will be tried on some of the street-railways in that neighborhood.

The motor appears to possess the elements that ought to make it successful as a substitute for horses. It is noiseless in its operation, and is entirely free from steam, smoke, or dirt. Power for operating the machine during a round trip is obtained by the great capacity which caustic soda possesses for absorbing heat.

The inventor, Mr. Moritz Honigmann, is a caustic soda maker in Germany. In seeking for an economical method of reducing the dilute soda to a solid form, he introduced a closed steam coil into the soda boiler. The coil having sprung a leak, Mr. Honigmann observed that no steam was given off from the surface of the soda solution, which led him to the discovery that the latter was capable of absorbing large quantities of steam and its contained heat without giving off vapor. This suggested the idea that a body of heated caustic soda might be used, in connection with a steam-boiler, to furnish the heat required for steam making during a short trip. The Honigmann caustic soda motor is the embodiment of this idea.

The motor has an upright boiler which is surrounded by an annular reservoir, which is filled with caustic soda highly heated. At the start, the heat of the soda mixture just keeps the steam in the boiler at the working pressure. When a start is made, the steam passing through the cylinders is exhausted into the soda-tank, where it is condensed and imparts its heat to the contents of the tank. This tending to raise the temperature of the soda, and the temperature of the boiler tending to decrease in proportion to the quantity of steam that has passed out, the magnified heat in the soda-tank passes into the steam-boiler, thus maintaining an equilibrium. After the motor settles down to regular work, the heat passes so quickly from the soda

to the boiler that the steam is maintained at an even pressure. For a short time there is more heat developed in soda reservoir and boiler than there was at the start, the increase no doubt resulting from the chemical reaction of mixing the soda with water, or its equivalent, steam. After a time the soda gets so diluted that its capacity for storing heat deteriorates, and the charge has to be removed and a fresh supply put into the reservoir. The deteriorated soda is restored in strength by evaporation of the moisture.

A Railway-Tie Nursery.

THE Hon. R. W. Phipps, Forestry Commissioner for Ontario, has been for several months devoting his time to visiting the principal fruit-tree nurseries and estates, where attention is given to arboriculture for timber and fuel. In a recent letter from southern Kansas to the *Toronto Globe*, he writes:

"One railway board here, knowing that the growing of wood, when set about in earnest, is neither a slow nor difficult task, has established in Kansas the largest artificial plantation of forest trees in North America. These railway gentlemen themselves gave out the contract for planting over a square mile of land with young saplings of the catalpa and alianthus; and their president, observing the success of their experiment, and impressed with its probable excellent financial results, has had planted at his own expense, as a speculation, as much more. These are situated near the little town of Farlington, Kan. These plantations, now bare of leaves, stretch far over the undulating prairie, in full view of the town. In summer their wide-spread surface of broad-leaved and pale green foliage forms one of the most beautiful sights of all this country. At proper intervals carriage roads are left through them, and it is a day's drive to examine them well; we obtain a carriage and horses and commence our observations. The different sections have been planted, it appears, respectively, two, four and six years ago. About one-fourth is planted with the alianthus, the rest with the catalpa, and a few, perhaps a thousand trees, of the white ash. Those first planted are now about 25 feet in height, the last about 12. Some of the taller are seven inches through the stem. The first seedlings were brought from Illinois by the car-load—the rest grown in seed beds here. There are in all about 3,000,000 of trees in full growing vigor on these plantations, this calculation leaving out a few on some small portions of poor land, which are not flourishing so well, but will yet be good trees in time. All were planted four feet apart each way to shade the ground, but eight feet is the ultimate intention, which will allow three-fourths of the trees to be cut out, a thing which can well be done when they are fit for fence-posts, say 7 to 9 inches through; or, if required, they can stay even longer without injuring the plantation. When rather larger it is expected the trees will give excellent railway-ties, and at their fuller growth of fifteen or twenty years they will supply very valuable timber for cabinet work and house building. Those who have only seen the original forest, with its trees growing at hap-hazard here and there, little ones and big, have but a very vague idea of the large amount of wood the closely-planted groves can spare in their process of growth. This process, partly

natural, is also by the art of the planter rendered partly mechanical. Extensive masses of young trees planted in this manner are restricted to but one method of advancement:—the endeavor to throw out masses of leaves to the light and air of the upper surface. The lower branches, hidden in shade, rapidly die and fall to the ground, and the plantation becomes a multitude of long, straight stems, full of life and vigor, but only spreading into branch and foliage at the summit. If a tree in youth be crooked it straightens itself, if thus surrounded, as it advances in height. One acre so growing will give of wood, which is all the better taken, quite a number of cords yearly till all the superfluous trees be gone. On each acre here there are 2,000 more trees planted than will ultimately be allowed to attain full growth. There will be left, perhaps, 900,000 to come to maturity, and as these as well as being very useful timber, are fast growing trees, the profits seem likely to be very large.

British Railway Earnings.

ACCORDING to the *Railroad Gazette*, the average earnings per train-mile of British railways have fallen every year but one since 1874, having been \$1.36 in 1874, \$1.26 in 1879, and \$1.19 in 1884. But the decrease in working expenses has been almost as regular, and until 1881 just as great, so that the net earnings per train were marvelously uniform, varying only between 60.24 and 61.36 cents per train-mile from 1874 to 1880. Since 1880, however, the decrease in expenses has not kept pace with that in earnings, and the net earnings have fallen off steadily. For seven years the earnings and expenses have been, in cents per train-mile:

	1877.	1879.	1880.	1881.	1882.	1883.	1884.
Receipts.....	130.50	126.24	125.42	123.48	123.80	121.76	119.12
Cost	69.38	66.00	64.74	64.56	64.94	64.34	63.19
Profit.....	61.12	60.24	60.68	58.92	58.86	57.42	55.94

The results are very much more uniform than would be shown in this country, even in those parts of it where rates are steadiest. The larger part of the reduction in expenses of the British railways has been in the cost of maintenance of road. This has fallen from 15.70 cents per train-mile in 1874 to 12.76 in 1879, and 11.64 in 1884. The decrease since 1874 has been 12.58 cents in the total expenses, and 4.06 in the maintenance; since 1879 it has been 2.82 cents in the total and 1.12 in maintenance. Meanwhile train expenses have decreased from 21.62 cents in 1874 to 16.38 in 1879, and 16.70 in 1884. Per mile of road there has been much less change. For the five years from 1874 to 1878 inclusive, they ranged from \$1,865 to \$2,020, for maintenance of road, and averaged \$1,965. Then they fell off suddenly to \$1,690, and have never been so low since, ranging thence to \$1,800 in 1883 and \$1,750 in 1884, and averaging \$1,751 from 1879 to 1884—nearly 11 per cent. less than the average for the five years previous.

The total expenses per mile of road have been comparatively uniform, ranging from \$9,665 in 1875, and \$9,625 in 1883, to \$8,775 in 1879, and the gross earnings have also shown less changes than might have been expected, averaging \$17,690 for the five years from 1874 to 1878, in which they never fell below \$17,295, nor rose above \$17,755. In 1879 they fell suddenly to \$16,780, but they recovered

immediately to \$17,555 in 1880, and for the five years ending with 1884 averaged \$17,905, reaching the maximum, \$18,255, in 1883. In this country the average earnings per mile were \$7,461 in 1883, and \$6,663 in 1884.

Railway Relief and Pension Funds.

GOVERNOR ROBINSON, of Massachusetts, speaks of relief funds as follows, in his inaugural message, submitted to the legislature:

"The board of railroad commissioners, in their report for 1881, urged the expediency of legislation sanctioning the coöperation of railroad companies with their employes, in the formation and management of funds for the relief of men disabled by accident or disease, and for pensions to the aged and to families of those dying in their service. I am assured that the present board also cordially approves such a measure. The general benefits of such a system, in the establishment of amicable relations between the corporation and its men, in the certain improvement of the character of the service rendered, in the substantial increase of security to life and property, and in the provisions for relief in cases of suffering and hardship, are so conspicuous that argument is hardly needed in support of any practicable plan to that end. The experience of the Baltimore and Ohio Railroad Company, employing nearly 20,000 persons, has fully demonstrated during the last five years the feasibility, humanity and wisdom of such a system. Legislation will be needed to enable railroad companies to form the kind of association necessary for founding and holding relief funds, and to protect such funds from attachment by creditors."

North Island Trunk Railway.

A COMMENCEMENT is about to be made with the construction of a tunnel, which is to form part of the North Island (New Zealand) Trunk Railway. It is at a place called Porotorau, near the head of the Wanganui. Works are also being carried out at Te Kuiti, once the headquarters of Kingism. These operations are taking a number of persons into the King Country.

Fire-Proof Paint.

SILICATE of soda, mixed with whiting and tinted with ordinary dry colors, will give a paint that is fire-resisting. It is also cheap. If used for wood-work, give it two or three coats of the silicate of soda as a preparation, and for the last coat mix with whiting to get a body, and color to any desired tint or shade. In general practice the paint should be of the same consistency as ordinary paint, and is applied in exactly the same manner. Tungstate of soda is rather better than the silicate, but is more expensive.

Some Brotherhood Figures.

IT is stated that the Brotherhood of Locomotive Engineers, which was organized twelve years ago and now has a membership of 15,000, has distributed among the needy, the sick, and the injured of its flock the magnificent sum of \$447,000. This is indeed a most creditable showing.

The men who have done this are the present and coming locomotive engineers of this country. They are illustrations of the truth that the two qualities—bravery and benevolence—go hand in hand. No man who is a coward ever gets to be a locomotive engineer, and hence engineers and their firemen are always benevolent and brave. To such men can those who travel entrust their lives, feeling certain that no accident will happen as the result of their neglect of duty. No class of men in the world realize more thoroughly the responsibilities of their employment than do the locomotive engineers and firemen. The acknowledged truth of the above is what gives the order the strength and public respect that belongs to it. A finer body of men does not exist.

Railway Mileage.

THE following figures on the laying of tracks on new railways appear in a late issue of the *Railroad Gazette*:

Carolina Central.—Extended from Shelby, N. C., west to First Broad River, 2 miles.

Chicago, Burlington and Northern.—Track laid from La Crosse, Wis., north 10 miles; also north of Savanna, Ill., 10 miles.

Marquette, Houghton and Ontonagon.—Extended across Portage Lake to Hancock, Mich., 1 mile.

Wisconsin Central.—Track laid from the line of Cook County, Ill., north 24 miles.

This is a total of 47 miles on four lines, making in all 295 miles thus far reported for the current year. The new track reported to the corresponding date for 15 years has been:

	Miles.
1886.....	295
1885.....	165
1884.....	334
1883.....	521
1882.....	1,181
1881.....	541
1880.....	975
1879.....	298
1878.....	226
1877.....	165
1876.....	304
1875.....	120
1874.....	198
1873.....	429
1872.....	642

These figures include *main track only*, second tracks and sidings not being counted.

A CANAL is proposed between Philadelphia and the Atlantic, bisecting New Jersey. Congress has appropriated \$30,000 towards surveying the country and preparing estimates on the total cost of the waterways.

THE Sleeping-Car Conductors' Mutual Aid Association of North America, has lately filed its articles of incorporation. The incorporators are: R. T. Cross, S. W. Rilea, E. P. Valentine, with offices at Chicago.

THE membership of the United Kingdom Railway Temperance Union inaugurated in 1882, has increased to about 10,000 employes, and the order has branches on almost every large railway.

THE Illinois Central Railroad will build a steel bridge over the Ohio river at Cairo. Its length will be 5,000 feet, with approaches about equal. It will approximate in cost \$3,000,000.

MR. A. POPE has been appointed general freight agent of the Norfolk and Western Railroad, and Mr. W. B. Bevell general passenger and ticket agent,

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A NEW VOLUME.

THE sixtieth volume of the AMERICAN RAILROAD JOURNAL opens with the present number, and judged on the merits and success of those immediately preceding it, may fairly hope to easily maintain the high standard and reputation for general and particular excellence attained and held by its efforts to provide a valuable and reliable publication, directly relating to railways and their interests. It has been the aim of the paper since passing into the hands of the new management to win for itself a position in its field that should be second to none; and at the same time possess the special features of accuracy and reliability of news, a careful summary of all of interest that occurs in the world of track and wheels, with that attention to the details of general composition and make-up which, while affording the fullest report of all essential or desirable information, avoids any unnecessary or irrelevant matter, and effects a clear and concise monthly compendium in its special line.

In the future, as in the past, the JOURNAL will continue its policy of affording a medium open to the dissemination, discussion, and report of all that in any way relates to the great interests it represents, and will thoroughly maintain its present high standard, both literary and typographical. The various departments of the paper, which so greatly add to its usefulness and excellence, will receive the same care and attention as heretofore. The contributions on matters of special and general interest will continue to be from the pens of writers fully competent, both by education and experience, to handle their subject in an intelligent and forceful manner, while the topics of the different departments will receive that careful investigation and attention hitherto devoted to them. The street-railway will still be treated individually, and no pains spared to maintain the present excellence of that department of the JOURNAL. The pages devoted to inventors and their inventions have always received and will, as hitherto, be treated with that care and attention due a subject of first importance.

The efforts of the present management have been directed to attaining one primary result: Accuracy, truth and impartiality, with thorough and intelligent supervision over the mechanical and literary departments of the paper, evolving an entirely reliable and accurate monthly railway record.

The AMERICAN RAILROAD JOURNAL feels justified in enjoying in no small degree the consciousness of work well done, and faithful effort crowned with success, and, while believing that it can give no stronger guarantee for future worth than the assurance that its standard of the past shall in nowise deteriorate, will none the less endeavor to improve.

THE GREAT STRIKE.

MR. JAY GOULD is a man whose phenomenal financial success naturally renders him subject to frequent and severe criticism on his methods both of acquiring and managing his accumulated wealth in its many forms. Much of this censure is doubtless undeserved, and of the character dealt out to all men of great wealth, almost without exception. Just or unjust, it is a fact however that Mr. GOULD has not been popular with the public, whose sympathy has hitherto gone against him in the contests between himself and those in his employ; but in the present quarrel the situation is reversed. Throughout the strike on his and the connecting lines in the west and southwest, Mr. GOULD's line of action has been temperate and forbearing, and to impartial judges, it would appear that he has done all consistent with his official and personal dignity to place matters on a mutually satisfactory footing. Certain it is that in this last and greatest contest between capital and labor, Mr. GOULD has public opinion on his side.

To properly estimate the rights and wrongs of the contest it is necessary to trace its progress from its inception, and to consider its cause. As is widely known, this latter lay in the discharge of a workman in the employ of the Wabash road in Texas, by authority and under the direction of the United States Court, as represented by its receiver. Granting a refusal to reinstate this man by the road to be a fair and just reason for a strike thereon, the mileage represented by the interested parties was but a small fraction of the enormous aggregate of line whose interest and business, and still more important, public obligations were for a time paralyzed and rendered null. Towns, communities, sections, and counties were deprived of their regular and looked-for supply of necessities, with the obvious result of so raising prices therefor in proportion to their scarcity, as to put all classes to an enormous aggregate expense, and individual trouble and inconvenience. And why? Simply because the workmen belonging to the order known as the Knights of Labor of a single road, failing to enforce their demand for reinstatement of a discharged employé, used the machinery, or their organization to force the men of outside lines to work with them.

These had no connection, however remotely with the question, or the authorities responsible for the discharge. There was no complaint of ill-treatment, or unsatisfactory wages. On the contrary, when the manager of the Missouri Pacific, surprised by the strike, asked of Mr. POWDERLY the reasons assigned, he, the head and front of the Knights of Labor replied, "papers say strike caused by discharge of man named Hall," and asks for a reinstatement of this Hall, pending investigation. It would seem

to the intelligent observer that the time for the investigation would have been before striking.

An agreement was entered into last spring between the railway managers and those of the labor order that, no strike should be made before holding an investigation on the point in dispute; yet these men struck in defiance of that distinct understanding, and, moreover after striking, admitted that they had no cause for difference with the roads in whose employ they then were, but simply and solely to support a demand of workmen on a totally distinct and separate line; a demand which neither Mr. GOULD nor his associates had the slightest power either to comply with or refuse. They hoped, however, by causing great distress to the public, and loss to the connecting lines, to enforce the claim utterly irrespective of the question of right or justice.

Let it be granted, however, that in all this they still kept within the law line, and were legally justified therein; for however unreasonable and tyrannical the attempted exercise of fancied power, we will admit the abstract right of using such strength as striking, whether justified or or not, gives them. Had the labor order stopped there, while public opinion would still have been against them, they could have truly responded to criticism and complaint, "it is our right." But this they did not.

The crimes of wanton blood-shed and destruction are chargeable to their violence, and in order to protect life and property, and to ensure their rights as citizens to those others who, needing work, gladly pick up what the strikers have cast away, it became necessary to call out an armed force, that men willing to work, should be afforded opportunity to peacefully earn their daily bread. When this last resource is called on it can only be the outcome of the strikers' wrong-doing and disorder, for so long as the line of law is not overstepped there can, in the nature of things, be no necessity of invoking military aid. It is only when the Knights of Labor say that what they do not want none shall have, be the price blood or treasure, that force is necessary to cope with the their defiance of law and order.

There is fortunately no unmixed evil. When this extremity is reached it forshadowes the disintegration and defeat of the responsible party: for the voice and opinion of the great public is then heard and expressed, and without this strongest of allies all causes fail. So is it with the present strike.

Primarily and instinctively, the people sympathize with the workingman, and quick to give labor the benefit of doubt, will suffer much before withdrawing its countenance and support. But when doubt ceases, and the certainty of a great wrong and oppression takes its place, the people's voice is heard in tones that permit no plea of deafness, and which utterly overwhelms and

drowns the noise and clamor of the party in the wrong.

With a steady and consistent course on the part of the railway managers, and the lines hitherto followed the strike is doomed to failure; and although the loss of life and property is much to be deplored, there is the compensating and satisfactory reflection that, while so vigilantly guarding against the stealthy approach of the dreaded king "Monopoly," we have escaped the serfdom of a far more dangerous ruler—the tyrant Labor.

EDITORIAL NOTES.

CHANCELLOR RUNYON, of New Jersey, has recently handed down a decision on a point in dispute concerning the New Jersey Central Railroad. Judge LATHROP, the former receiver of the road, made contracts with parties for the delivery of certain supplies required by the road. Before the final settlement of this agreement Receiver LATHROP died, and was succeeded by Receiver LITTLE. In the meantime the supplies are delivered, and payment demanded of Mr. LITTLE. He, for some reason, possibly a good one, does not desire the supplies, and refuses payment, or any responsibility for the acts of his predecessor, and Chancellor RUNYON'S opinion supports his position. If this be a sound judgment, and is generally so understood, it would seem not impossible that receivers thereafter might find some difficulty in transacting very necessary business. It may be good law, but it is poor justice.

* * *

THE Brotherhood of Locomotive Engineers has hitherto kept clear of any entangling alliance in the present strikes. A finer body of men never gave their daily toil for bread. They have courage, brains, and power, but an instance of the latter arbitrarily exerted is yet to be adduced. If the Brotherhood were but a type of labor generally, strikes would be unknown.

* * *

WHATEVER may be said for or against the establishment of a national railway bureau, one consideration of great consequence is at once presented to the mind. The members of such a commission would of necessity be subjected to an influence and power far in excess of that representing any other one special interest of the country. Experience has shown that this influence would be by no means idle or inactive, where appear results so promising as those to be attained by a successful attack on the integrity of a public body, invested with a power which wielded in the strict interest of the people would make so vast a difference in the relations of that great body and the corporations which would be affected by its official action. The point is worthy of careful consideration.

THE boycott as a weapon of the labor organizations seems rapidly to lose its edge. At all events the latter is transferred from blade to hilt; and in the warfare waging, it will need an iron grip to keep the sword from slipping in the wielder's grasp, and drawing blood. That labor has the instinctive sympathy of the people is undeniably true; but when a point is reached where the oppressed become oppressors, that first of friends and allies—public opinion—joins issue with the enemy, and labor must surrender. The famous bakery of Hudson street, and Mrs. Gray, its plucky owner, fully illustrate the truth that tyranny attempted in the guise of justice is doomed to failure; and, further, will recoil upon the tyrants.

* * *

DR. S. S. HERRICK, the author of the admirable series of articles on "Railway Medical Service," which have appeared at intervals in the JOURNAL for several years past, has severed his connection with the State Board of Health of Louisiana, of which he has been secretary for many years. Dr. HERRICK has devoted years of study to the subject of railway medical service; first in its sanitary and afterwards in its practical aspect, and, as we said last month, in knowledge of the subject he stands unsurpassed. His studies have given him unusual opportunities to become qualified for organizing and superintending a medical department upon a leading railway of the country, and we are pleased to hear that he is prepared to entertain a proposition of this nature. It would seem likely that some road will hasten to secure his services in such capacity.

WE have received from the *Railway Master Mechanic* the Official Railway List for 1886. Higher praise can not be given than to say that it in all respects maintains the standard of the issues of previous years. It forms a most valuable cyclopædia of general information of much interest and use to the laity as well as to the profession. It is a complete and accurate index of all the officers, superintendents, managers, agents, and office-holders generally connected with the various railways of the country; and the vast amount of valuable information it contains is skilfully classified, and provided with an admirable index which renders reference easy. It is a work which no one whose interests, however remotely, relates to railways should be lacking.

THE April *Century*, completing the thirty-first volume, or the ninth volume of the new series, is an exceptionally interesting number. The war series is continued by three valuable, illustrated papers on the famous confederate cruiser, *Alabama*. "Life on the *Alabama*," by P. D. Haywood, one of the crew; "Cruise and Combats of the *Alabama*," by Capt. John McIntosh Kell, her executive officer, and "The Duel Between the *Alabama* and the *Kearsage*," by Dr. John M. Browne, surgeon of the latter vessel. "Creole Slave Songs," by George W. Cable, with musical arrangements, and "Toy Dogs," by James Watson, are among the remaining illustrated contributions to the number.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citize's Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N. Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

HONESTY AS POLICY.

THE Broadway Street-Railway franchise seems in a fair way to be repealed, and the coveted result of a long and laborious course of dishonesty and corruption to end in bitter disappointment to the chief conspirators.

The Aldermanic Board of 1884 must have been rudely awakened to a belief that there is a God in Israel, and by this time, in all human probability, sadly and severally admits the force of the old saw naturally suggested by our heading.

There can be no doubt in the least intelligent mind that bribery and fraud were the prime factors of the Broadway railway steal. It is unfortunately possible that, as so often before, the principals may go unpunished, for lack of evidence to convict, but the public is none the less convinced of their guilt, and will not easily forget the names of those implicated.

The public is an amazingly patient and long-suffering beast of burden, and submits to an almost limitless amount of misgovernment and fraud; but there exists the proverbial straw which brings about the spinal (and final) fracture. When this point is reached the people call a halt; and the order is one requiring prompt obedience, failing which the results are apt to be somewhat disastrous. From all indications the Broadway outrage seems to mark a line beyond the limit set for steals, the crossing which has roused a determination that the time has come to demonstrate that there is not, as seems generally to be believed, a law for one class only; to which the law-makers cannot be held accountable.

Judged from its lowest stand-point, in this instance at least, honesty would have been policy. Broadway needed the railway, as results have plainly shown; and the opposition to the scheme arose not so much from any objection to the presence of the road, as antagonism to JACOB SHARP, and the methods which everyone felt certain he would use to gain his end. The foregone and subsequently justified conclusion of the public, that no means, however, dishonest would be spared to gain the good will

of a body of men notoriously corrupt, naturally resulted in identifying the road with the rascals, and brought down upon it the hearty denunciation and opposition of the public; and unless the people's resentment cools much sooner than seems likely, an ample opportunity for meditation and a change of heart will be afforded by a generous State government to the City Fathers of 1884.

Can we but venture to believe that the lesson will suffice forever to rid our city of its domination by the gangs of political brigands who fatten on our wrongs, the cloud is lined throughout with silver, and the purchase is worth the price.

TWELVE hours seems now the generally accepted limit for a day's work on the horse-railways, and the result so far appears to give general satisfaction. It is not probable that any man can work to advantage more than one-half of his entire time, and if this be true, the question of hours is one entirely removed from that of wages, for whatever they might be, high or low, a day's work of more than twelve hours must be a bad investment.

STREET-RAILWAYS ON THE CONTINENT.

BY MARVIN C. WILLIAMS.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE street-railway service as managed on the Continent of Europe would doubtless commend itself more favorably to the average traveler than either that of Great Britain or our own country. It must be admitted that in certain features and regulations appertaining to the continental service, the advantage lies on that side of the water.

It is not that the roads are better laid, manned, or equipped, or that transfer thereon is in any way more expeditious, for in these points the several countries mentioned are not far from being even.

To that widely known and popular character, the "casual observer," the feature of continental tramway travel which chiefly claims his admiration and approval is the entire absence of crowding in the cars; the law prohibiting the carrying of any number of passengers in a car exceeding that of the seats. In addition to this regulation, in favor of which much can be said, another distinctive custom common to nearly all countries of Europe, is the carrying of passengers on the car-roofs. This latter would certainly seem, where practicable, a plan in all respects advantageous, as it provides a first and second class rate of fare, gives a larger seating capacity, and combines the advantages of both our summer and winter cars. As to the effect of two rates of fare on a company's receipts, the point would demand a thorough trial of both methods under precisely equal conditions, and a careful comparison of results. That, however, is a question which does not so directly affect the comfort of travelers, as the mere personal one of accommodation.

It must without doubt be granted that much is to be said in favor of a law compelling all tramway companies to provide a seat for every passenger, but it should be

remembered that while such a law ensures a seat to each passenger in the car in which he is conveyed, it will at times follow that he will be without the means of conveyance at all, for at best the law can but prohibit a company from carrying in a car more passengers than it has seats. At such a time a would-be patron of the road is rather apt to resent his legal disability to stand up if he so wishes, and arrives at the conclusion that the law approximates too closely the paternal. It is true that the double-deck character of the street-car of Europe to a great extent obviates this objection, that is to say, proportionably; but it is by no means an unusual circumstance in Paris or Turin, to be compelled to wait while half a dozen cars pass before one is found with the sign "full" turned down. It is also probable that even with the use of the roof, the continental car, divided as it is into separate seat spaces, would fall short by a considerable number of the capacity of a crowded American car, with the customary platform attachments.

The introduction of the roof system into the cities on this side would, however, be a considerable gain in comfort and convenience. New York unfortunately is past the point of that improvement, as the slight elevation of many portions of the elevated roads would render it impossible.

As to the lauded virtue of the no-seat-no-ride plan, it would perhaps at least be worth the trial, could it be shown that the companies would increase their accommodation to an equal carrying capacity. Even then it is probable that the main result would be that those who now do not ride from sheer inability to incorporate their persons into a solid mass of motionless humanity, would then perceive a revised and enlarged opportunity for enjoying erect transportation, of which they would promptly take advantage; for it may be fairly doubted if any free and enlightened American citizen would tamely submit to forcible deprivation of his cherished right and privilege to be uncomfortable.

PROGRESS OF ELECTRICITY AS A MOTIVE-POWER.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

YOURSELF, Mr. President, in words glowing with eloquence, stated at our last Convention, how little we know of the wonderful force called electricity. "Electricity" was derived from the Greek word *elektron* expressive of amber. Thales of Miletus, a celebrated Greek philosopher, 600 years before Christ, having observed the remarkable property of amber by which it attracted light particles of matter upon being subjected to a peculiar kind of excitation by friction, called this force electron. Nearly 2,500 years have since elapsed, and we still only know this wonderful force by its effects. Electricity has been defined by Grove as "that affection of matter or mode of force which most distinctly and beautifully relates other modes of force and exhibits, to a great extent in a quantitative form, its own relation with them and their reciprocal relations with it and with each other." Wells wrote, "Electricity is a subtile agency or force without weight or form, that appears to be diffused through all nature existing in all substances, without

affecting their volume or temperature, or giving any indication of its presence, when in a latent or ordinary state. When, however, it is liberated from this repose it is capable of producing the most sudden and destructive effects, or of exerting powerful influences by a quiet and long continued action."

Tyndal wrote, "We have every reason to conclude that heat and electricity are both modes of motion; we know experimentally that from electricity we can get heat and from heat, as in the case of our thermo-electric pile, we can get electricity. But, although we have, or think we have, tolerably clear ideas of the character of the motion of heat, our ideas are very unclear as to the precise nature of the change which this motion must undergo in order to appear as electricity—in fact, we know, as yet, nothing about it."

Gordon wrote, "We have as yet no conception of electricity, apart from the electrified body; we have no experience of its independent existence." * * He estimates that "The velocities in air of light and of electromagnetic induction are sensibly equal—185,521 miles per second."

Wheatstone, in 1834, by a beautiful experiment, showed that the velocity of an electrical discharge through a copper wire a half mile in length was 288,000 miles per second. The results obtained by the United States Coast Survey, with galvanic electricity and iron wire, show a velocity of from 15,000 to 20,000 miles per second. Your committee will not occupy your valuable time in enlarging upon the wonderful discoveries that have resulted from the investigations of Faraday, Cavendish, Franklin, etc., etc., but will proceed to speak of the application of this force.

One of the oldest electric motors was that of the Abbé Salvatore del Negro, Professor of Natural Philosophy at Padua. A dynamo machine made by him and recently exhibited, bears the date 1830. It consisted of a magnet movable around an axis, situated at about one-third of its length, the upper extremity of which was capable of oscillating between the two branches of an electro-magnet. A current being sent into the electro-magnet, passed through an 8 cupped mercurial commutator that the oscillating magnet controlled by means of a rod and a fork. As a result of such an arrangement, when the magnet had been attracted toward one of the poles of the electro, this very motion of attraction, acting upon the commutator, changed the character of the current, and the magnet was repelled toward the other branch of the electro, and so on. This apparatus possessed an interesting detail. The movable magnet, where it touched the poles of the electro, abutted, not against the iron itself, but against the insulating wire that covered it. Either by accident or design, the author thus avoided those inconveniences connected with remanent magnetism, which afterwards embarrassed other inventors.

March 1st, 1834, an English patent was taken out by Henry Pinkus, for a "dynamic-traveler," intended to propel vessels and carriages on canals, railways, and common roads, by means of magnets and electricity, as well as pneumatic power.

In 1838 Mr. Cook, of Saratoga, N. Y., made an interesting exhibition of an electro-magnetic machine, in Barclay street, New York. In 1838 and 1839 Prof. Jacobi, by

means of an engine on the same principle, propelled a vessel, containing ten persons, along the Neva, at the rate of four miles per hour.

In 1841, "The Germanic Confederation, desiring to acquire, for the purpose of publishing for the public good, the secret by which citizen Philip Wagner, of Frankfort, makes use of electro-magnetism as a moving force, will secure to the said Wagner, for the exclusive possession of his secret, the sum of 100,000 florins (\$55,000), on condition that he cause an electro-magnetic machine to be constructed at his own expense, and upon a sufficiently large scale to serve as a locomotive." We do not find that Wagner accepted this proposition.

In 1841 Robert Davidson, a mechanic of Aberdeen, exhibited working models of a turning lathe, printing machine, saw-mill, and locomotive carriage, driven by the power of electro-magnetism. In October, 1842, his electric locomotive carriage was tried upon the Edinburgh and Glasgow Railway. It was 16 ft. long, 6 ft. wide, and weighed about 5 tons. Speed about four miles per hour. Time will not permit a description of Joule's electro-magnetic engine, Davenport's, Lockett's, Clarke's, Wright's, Taylor's, Watkins's, etc., etc. In 1840, Prof. Page, of Salem, Mass., invented a new form of electric engine, based upon the principal of the axial force of electro-magnetism, which proved very successful, and Congress appropriated \$30,000 to construct and operate such a locomotive. It was built in 1851, and used to propel a train between Washington and Bladensburg, five miles. It weighed, with batteries, 10½ tons, and carried seven passengers at the rate of nineteen miles per hour.

We must not omit to mention that in 1833, Prof. Henry, of the Smithsonian Institute, invented the first motor for producing rotary motion by electro-magnetism, without a reciprocating action.

The first machine for the production of a current constant in direction and intensity, is said to have been the electro-magnetic ring machine of Dr. Pashinatti, of Pisa, Italy, in 1860. "Wilde, in England, constructed a machine in 1866, involving several new principles, and possessing a power before undreamed of. It is the type and original of many of the best machines now in use." (Younge).

In 1869 M. Griel, a French military officer, invented an electric motive engine, based on the action of currents on currents. He stated that he could apply his machine to railroads, and, by causing the electricity to wash from the wheels of the machine upon the rails, ascend any grade with the greatest facility. In 1872 the Gentry Electric Railway Car was exhibited at Nashville, Tenn. This engine was composed of a number of magnets. The armature was made to work by breaking and closing the circuit. It was proposed to build an elevated railroad upon poles set in the curbstone and carry mails and light packages at a *speed of one hundred miles per hour!*

The efforts, so far, of inventors were directed to the application of electricity generated by the action of acid upon zinc. Prof. Morton wrote, "The source of energy in the battery is practically the zinc consumed; weight for weight coal has almost six times the available energy of zinc; while, moreover, the price of zinc is about twenty-five times that of coal. In the race between the two, therefore, zinc starts with this enormous disadvantage, that an equal amount of energy obtained from it, will cost

about 150 times as much as if obtained from coal." According to Joule, the consumption of a grain of zinc, though 40 times more costly than a grain of coal, produces only about one-eighth of the same mechanical effect. The power obtained in this way was too expensive to compete with steam. Dr. Adams wrote upon this subject: "You ask, I imagine, what has rendered possible at this day (1884), that which was thirty years back demonstrated impracticable; and in what respect does the *modern* electric railway differ from that of the past? My answer is: That which has rendered the electric railway commercially feasible, is the discovery by Messrs. Varley, Siemens, and Wheatstone, and the subsequent developments by many others, of the dynamo-electric machine; and the further discovery or demonstration by MM. Fontaine and Gramme, of the reversibility of that machine, which admits of its being transformed into the most efficient form of an electric motor, when a suitable electric current is passed through it. The *difference* between the ancient and the modern electric railway consists in the fact that, whereas the effort was formerly made to use electricity as a *primary* motive power originating from the consumption of zinc and acid, we now use the electric engine or electro-dynamic machine, as a *secondary* motor, and the electric current simply as a means of transmitting power procured from natural sources, or previously generated by any of the known economic methods."

Greer states—"When the late lamented Clerk Maxwell was asked by a distinguished scientist what was the greatest scientific discovery of the last quarter of a century, his reply was, 'That the Gramme machine is reversible.' If he were alive to-day, he would probably say that the storage of electricity was the greatest invention or discovery of the last quarter of a century." Gramme first described his continuous-current machine in 1871, and his alternating machine in 1878. If an electric current be sent through the wires of a Gramme machine, the armature will revolve, and the machine can be employed to do mechanical work. By means of two such machines, one driven by water or steam power to generate electricity, the electric currents produced can be carried through insulated wires to the second machine, at a greater or less distance, which they will cause to revolve and do mechanical work.

We now reach the first practical electric railway. In 1879 Dr. Werner Siemens introduced his electric railway at the Berlin Industrial Exhibition, with an isolated center rail. During the summer of 1880 it worked at the Brussels Exhibition, and May 16th, 1881, the first electric railway was opened for passenger traffic at Berlin, by Messrs. Siemens and Halske. It was about 1½ miles long. Gauge, 1 meter (3 ft.). Permanent way was constructed as upon ordinary railways, on cross ties, with steel rails connected by fish-plates and short straps of iron, bent in the form of a bridge, to allow contraction and expansion of the rails, and reduce electrical resistance. Currents were low tension, and no difficulty was experienced in using the one rail as positive, the other as negative, conductor. A steam-engine ran the dynamo, and the current was carried from it to the rail underground. The car was similar to ordinary tram-cars, seating twenty persons. Each end was provided with starting levers, brake-handle, and signal-bell. The dynamo machine

under the car transmitted its movements to the wheels by spiral steel springs. The wheel-tires are insulated from the axles, and run in electrical connection with brass rings, fastened on the axles, but insulated from them. Contact brushes were pressed against these brass rings, and from them the current was conducted to the dynamo machine, setting it in motion. Greatest speed allowed, 124 English miles per hour. In 1882 a second car was placed on the line, when it was found that the two cars moved in either direction as safely and with the same speed as a single car, but the steam-engine that provided the electric current, had to exert twice the power. On the tramway from Charlottentien to the Spandauer Berg, in the western outskirts of Berlin, Dr. Siemens overcame a rising grade of one in thirty. The line, constructed as an ordinary tramway, is distinguished by two thin wire cables, about 9 inches apart, and carried on telegraph poles, about 15 feet high. These cables are parallel to the track, and upon them runs a small 8-wheeled carriage. A wire extending from this to the tramway-car dynamo, conveys the electricity to the latter. This was the form adopted at the Paris Exhibition, but it was said that not a little difficulty was experienced from this carriage getting off the wires. This plan was likewise adopted for the Siemens' Electric Railway at the collieries of the Donner-smarckhütte Co., in Silesia. Speed on latter, 8 miles per hour. In October, 1881, work was begun on an electric railway between Portrush and Brush Mills, in Ireland, by Sir W. Siemens. Capital stock, about \$225,000. The line, about 6 miles long, is worked by electricity generated by turbine water wheels. Gauge, 3 feet. One-half mile is in a street in Portrush, balance in a country road. Rails are laid on one side of the road, and ordinary traffic cut off by raised curbstones. It has grades of 1 to 35, and occupies a space 6 feet wide in the street. An underground cable carries the electricity to a "T" iron, supported on posts 10 feet apart. It is 22 inches from the inside of track-rail, and 17 inches above the ground, to some extent forming a fence. From this "T" iron the electricity reaches the motor, through two brushes, one at each end of the motor, pressed against the "T" iron by springs. At each road-crossing this "T" iron is necessarily left out, and the current is carried across by buried insulated copper wires. The car is long enough to reach across most of these openings, so that one brush touches. In dry weather this rail has to be lubricated, but in wet weather the dampness suffices. From the brushes the current passes to commutator, worked by a lever, thence through the axle-boxes to the axles, through the wheels to the rails. The latter are insulated and carry the return current back to the generating machine. Speed, 10 miles per hour. In 1883 the electric railway at Wimbledon was in operation. Speed, 6 miles per hour with nineteen passengers, over rough track. The current was generated from a Weston dynamo, and driven by a twelve h. p. engine, and carried by two flat copper bands, an inch broad, laid in the bottom of a groove in long wooden troughs between the rails, supported on wooden blocks saturated with pitch. The insulation was quite perfect.

The electro-motor invented by Leo Daft, was given a trial Nov. 24, 1883, on the Saratoga, Mt. McGregor and Lake George Railway. The small motor hauled a passenger car well filled, over a mile and a half of road; but

on the return trip jumped the track at a sharp curve and was wrecked. Gauge, 3 feet. Track prepared for motor by tightening fish plates and laying a center insulated rail upon wooden blocks, saturated with pitch. Surmounted a sharp curve and 9.3 feet grade. The motor weighed 4,500 pounds, was 9 feet 6 inches long, 5 feet wide, and 3 feet above rail, provided with necessary levers, etc. Two phosphor bronze wheels, pressed firmly upon the center-rail by steel springs, carried the electricity to the switches and key-boards, thence to the electric-engine and through the driving-wheels to the outer rails. It is claimed that experiments proved the electricity increased the adhesion 20 per cent., a most important feature. The motor took 17 tons of car and passengers, and it was said no difficulty was experienced from snow and ice.

Thomas A. Edison built an experimental line at Menlo Park. The motor contained a dynamo, but appeared like a small locomotive without a smoke-stack. A speed of 40 miles per hour is said to have been obtained. Stephen D. Field spent years in perfecting his system of electric motors, and the Electric Railway, at the Chicago Exposition of Railway Appliances, was a combination of the Field and Edison systems. The electricity was communicated from a stationary dynamo to the motor by an extra insulated rail (in the center of the track), through brushes bearing upon each side of the latter.

Dr. W. Adams exhibited a working model of an Electric Railway in St. Louis, in April, 1884. He stated, "This idea of the generation by dynamo-electric machines of powerful currents of electricity at stationary points, and the transmission of these electric currents to cars while in motion, for the purpose of effecting their propulsion, was first put into execution in 1879, by Dr. W. Siemens and myself, both working independently and mutually, ignorant of the other's doings." Dr. Adams proposed to "apply the electric power directly to every wheel, to the point of traction where the power is absorbed, the work done, and yet our wheel is neither an 'armature' nor a 'field' of a dynamo. It is both combined. * * * Each wheel is animated, having a power within itself. Hence every wheel becomes a veritable locomotive."

W. M. Thomas, of Cincinnati, in his patents, proposed to carry an electric current through two insulated copper wires placed in an iron tube in the horse paths, making this tube open top and bottom, the former to allow contact between the motor and the conductors, and the latter to permit water and dirt to drop through into a tunnel beneath, thus keeping the conductors clean.

(To be concluded.)

French Method of Treating Steel.

FURTHER tests of the new French treatment of steel for rendering it tough appear to confirm its value, imparting to it also a fineness of grain, an increased hardness, and a notable accession of strength to withstand rupture; this effect being most marked in the case of highly carbonated steel, and in this respect the metal is made to resemble tempered steel, without being in all points identical with it. The cause of this alteration in physical condition is attributed to the rapid heating and no less rapid cooling of the metal; that is, when the red-hot

steel is first strongly compressed, which is the peculiar feature of this process, the conversion of the mechanical energy into heat serves to raise the temperature of the entire mass, at the same time that the particles of the metal are more closely cemented together; this effect is followed by a rapid cooling, due to the contact of the plates of the hydraulic press with the surfaces of the metal, and the very close pressure materially increases this conducting effect of the cold metal.

STREET-RAILWAY NEWS.

ALABAMA.

The Anniston Street-Railway Company has been incorporated by A. L. Tyler, S. Noble, J. W. and Wm. Noble. Capital, 20,000.

The Birmingham and Pratt Mines Street-Railway Company has been incorporated by J. A. Van Hoose, J. R. Smith, and others. Capital stock, \$100,000. The right-of-way has been granted and stock subscription books opened.

The Mobile City Railway Company has elected officers as follows: President, A. A. Spiro; Secretary, John Maguire; Treasurer, Meyer L. Goldsmith; Superintendent, W. Frolickstein.

COLORADO.

The Denver Street-Railway Company has brought suit against the Denver Electric Railway Company to prevent it from operating its line by other motive-power than electricity. The latter company is enjoined from using horses, and as the electric-cars are a failure, it is trying to evade the agreement by using mules.

The Trinidad Street-Railroad was recently sold at auction. There were only two offers, of \$3,000 each, both of which were refused. A citizens' syndicate has now guaranteed its purchase.

CONNECTICUT.

The senate has authorized the incorporation of the Meriden Horse-Railroad Company, capital, 15,000, with power to increase to \$200,000.

DAKOTA.

Rapid City will have a street-car line this spring. Piene has now the only line in the territory.

DISTRICT OF COLUMBIA.

A car of the Metropolitan Line, Washington, was run into on February 27th by an engine at the crossing of Virginia avenue and the Baltimore and Potomac Railroad. The car was nearly demolished and the passengers badly shaken up, but not seriously injured.

The Union Passenger Railway Company has been incorporated to build a line in Washington. Capital, \$100,000. Incorporators: E. N. Gray, W. F. Sadler, and others.

The Washington City and Bladensburg Railroad Company and Land Association has been incorporated to build an electric railway from Washington to Bladensburg, Md., and to deal in land. Organized at Bladensburg by James N. Tinker, W. H. Frear, and others.

GEORGIA.

The Metropolitan Street-Railway Company, Atlanta, will extend its line to Grant park and build new stables.

The Habersham street-car line, Savannah, will shortly be extended to the new southern limits of the city by the Coast Line Railroad.

The Rome Street-Railway will be extended two miles to a new park.

ILLINOIS.

The Aurora Street-Railway is proposed to be extended through a thickly settled portion of the city.

The Chicago City Railway Company will extend its Hyde Park dummy line to Sixty-ninth street.

The Davenport and Rock Island Street-Railway Company has been incorporated to build a line across the Mississippi between these places. Capital, \$30,000. Morris Rosenfeld, H. G. Connelly, Henry Curtis.

The Freeport Common Council have granted a franchise for a three-mile line to H. J. Northrop, vice-president and manager, New York Construction and Improvement Company.

The North Chicago Street-Railway has been sold to a Philadelphia syndicate for \$1,750,000. Mr. C. T. Yerkes has been elected president.

Sterling is to have a street-railway.

The Streator Surface Street-Railway Company has been incorporated by H. A. Foster, Daniel Hienan, and others. Capital, \$50,000.

The Union Elevated Railway Company, Chicago, has been incorporated by Michael Ryan, county clerk, P. A. Hoynes, United States commissioner, and others. Capital, \$10,000,000.

KENTUCKY.

A new motor for street-cars has been brought out by Mr. W. P. Emerson, of Frankfort. It is operated by levers in the manner of a hand-car, but it is so proportioned that it is claimed a loaded car can be driven with little more exertion than driving a sewing machine.

The Frankfort Street-Railway Company has been incorporated.

The Frankfort, Bellepoint and Leetown Street-Railway Company is to be incorporated.

Louisville has 111 miles of street-railway—single-track.

MASSACHUSETTS.

The Acushnet Street-Railway Company, of New Bedford, has been authorized to operate by electricity. The Massachusetts Electric Power Company, Boston, has the contract for Daft motors.

The Brockton Street-Railway Company now pays its drivers and conductors by the week, which results in an advance of wages.

The Fall River Board of Aldermen have granted a location to another street-railway company organized by Mr. Geo. H. Seeley, of New York, principal owner of the Worcester street-railway. It will be a rival of the Globe Railway Company. The entire location asked for was granted on the condition that the whole route be paved with granite blocks, and that bonds be given for the completion of the road in six months.

The Gloucester has awarded contracts for 230 tons of steel-rails (160 tons to the Johnson Rail Company, and 70 to the Cambria Iron Company, for T-rails); 5,500 ties, Chas. H. Brigham, Hudson; 20,000 tons of cobble stones, 100,000 paving blocks. Cars are being built at the Jones Works, Troy, N. Y. Line to be ready by May 2d.

The Haverhill and Groveland Street-Railway will be extended through the Highlands and also to West Newburg during the spring.

The Springfield Street-Railway Company has given a contract for 75 tons of steel rails to the Worcester Steel Company.

MICHIGAN.

Mr. M. W. Greenwood, of the Fort Wayne and Elmwood line, thinks Detroit street-railways will soon have some other motive-power than horses. He favors electricity, with third-rail as preferable to the overhead wires.

The Grand Rapids cable road will be commenced soon.

The Windsor Electric Railway Company have been authorized to lay track through the street.

MINNESOTA.

A Minneapolis Cable Railway Company has been organized.

A motor line is to be built from Anoka to Champlain. The incorporators are: J. E. Osborne, Chas. M. Loring, W. S. King, and others.

The Lyndale motor line will experiment with the Honigman soda motor.

The Minneapolis and Champlain Railroad Company has been incorporated. Capital stock, \$500,000. President, Geo. Brackett; Secretary, G. W. Marchant.

MISSISSIPPI.

The Hill City Street-Railway Company is to be incorporated.

MISSOURI.

The elevated railway to connect Kansas City, Mo., with Kansas City, Kan., has been enjoined from proceeding with the work.

The Northern Central Street-Railroad Company, St. Louis, has opened its line, and has received 40 cars from the John Stephenson Company, and others from local builders. It is the fifteenth street-railway in the city.

NEW JERSEY.

The Guernsey Improvement Company has cancelled its contracts for improvements at Cape May. They included a railway from the steamboat landing to Sea Breeze, and another thence to Sewell's Point. The Cape May citizens are hostile to non-resident property owners.

A horse railway is proposed in Asbury park and Ocean Grove.

NEW YORK.

The Binghampton cable road dispenses with the grip. A small cable driven by the main cable passes over a drum attached to the car. When the drum is free to revolve the cable simply turns it, when it is stopped by a brake the car is carried on with the cable.

The Brooklyn City Railroad Company has leased the line on Jamaica road, between East New York and Cypress Hills, for \$65,000 for 99 years. The same company will also erect a large hotel at Fort Hamilton.

The Fishkill and Matteawan Street-Railroad Company has been incorporated by John Kingsley, Sandy Hill; Charles D. Haines, Brooklyn, and others. Length two miles. Capital, \$25,000.

The Greenbush Street-Railway is laying track on Riverside avenue and Broadway.

The Lutheran and Cypress Hills Railway Company

(Brooklyn) had its depot burned February 26th. The depot, sheds, and stables were burned, with forty cars, seven motors, and a quantity of harness. The horses were saved with difficulty. Loss over \$100,000. Partly covered by insurance.

The representatives of the New York street-railway companies have formed a union so that they may all act together in the event of any future strike.

The senate has passed a bill providing that street-railway franchises shall be sold to the bidder who will undertake to carry passengers at the lowest rate.

The Seneca Falls and Waterloo Street-Railway has received another steam-motor from H. K. Porter & Co., Pittsburgh.

The Syracuse and Onondaga Railway Company proposes a belt line.

PENNSYLVANIA.

A street-railway is proposed for Apollo. Mr. W. J. Guthrie is interested.

The Pittsburgh, Allegheny and Herr's Island Street-Railway Company is the applicant for the right-of-way.

The Pittsburgh, Knoxville and St. Clair Street-Railroad Company has been incorporated by Thomas Evans, Pittsburgh; J. E. Duncan, Chartiers; J. W. Patterson, Knoxville. Capital stock, \$60,000.

The Philadelphia street-railways have a total authorized capital of \$32,766,200, of which \$10,408,102 90 is paid up. The aggregate cost of lines and equipments is \$5,903,920.76. Last year there were 117,171,621 passengers, and the total dividends were \$991,990.

RHODE ISLAND.

The Pawtucket Street-Railroad Company has decided to make considerable extensions to its lines.

SOUTH CAROLINA.

The Enterprise Railroad Company, of Charleston, has completed and opened for traffic its new line to the Ashley bridge, across which it is intended to extend the line ultimately. There are six new cars from the J. G. Brill Company, Philadelphia. Thirty new horses have been added to the stock.

TENNESSEE.

The Chattanooga Street-Car Company will shortly commence work on its double-track.

TEXAS.

The El Paso City Street-Railway Company has been incorporated by H. M., J. J. and L. L. Mundy.

The Houston Street-Railway Company's directors have elected the following officers: President, W. H. Sinclair, of Galveston; Vice-President and General Manager, H. F. McGregor; Superintendent, H. Freund; Secretary and Treasurer, E. H. Bailey, all of Houston.

WISCONSIN.

The Appleton (Wis.) Electric Street-Railway Company has been incorporated by J. E. Harriman and others. Capital, \$35,000.

At La Crosse, on March 22d, a street-car broke through the La Crosse River bridge and fell into the river. The horse was killed, the car shattered, and the passengers more or less injured.

New Inventions.

Witmer's Car-Starter.

ABRAHAM R. WITMER, of Safe Harbor, Penn., is the inventor of a new form of car-starter, the construction and operation of which are shown in the accompanying cuts.

The object of this invention is to furnish car-starters so constructed that the momentum of the cars can be stored up and held to be used in starting the cars, and to assist the horses in drawing the cars up heavy grades and around curves, and which shall be simple in construction and easily controlled.

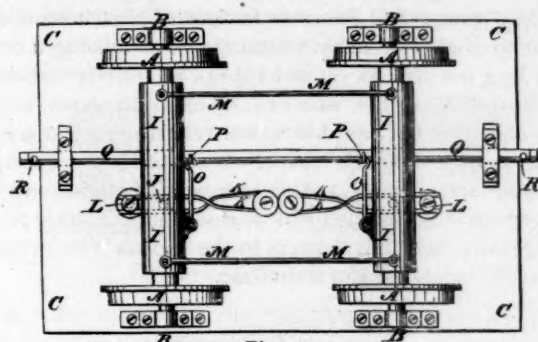


Fig. 1.
WITMER'S CAR-STARTER.

Fig. 1 is an under-side view of the improvement; Fig. 2 is a sectional side elevation; Fig. 3 is a sectional end elevation; Fig. 4 shows one end of the spring disconnected from the axle; Fig. 5 shows one end of the spring connected with the axle, and Fig. 6 a device by which the momentum of the car is held for future use in such manner as to start the car in either direction or in assisting to ascend grades, or pass around curves at street corners.

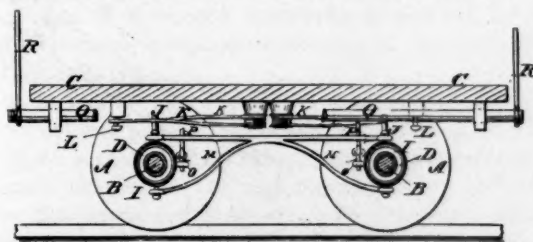


Fig. 2.

WITMER'S CAR-STARTER.

A are the wheels, and B are the axles of a car, which are constructed and connected with the body C, in the usual manner. Upon the middle part of each axle B, is placed a loose sleeve D, around which is coiled a spiral spring E, the sleeve preventing friction between the spiral spring E, and the axle B, when the spring is put under tension. The ends of the spiral spring E, are attached to clutch-collars F, placed loose upon the axle B, and the teeth of which, when the said clutch-collars are left free, are held in gear with the teeth of the clutch-collars G, permanently attached to the end parts of the axle B, so that the two clutch-collars F, and the spiral spring E, will be carried around by and with the axle B, in its revolution.

tion. Upon the clutch-collars G, are placed clutch-collars H, which are permanently attached to a tubular case I, and are thus rigidly connected together, so that when one of the clutch-collars H, is in gear with one of the clutch-collars F, the other clutch-collars H F, must be out of gear. The clutch-collars F, equal in thickness the combined thickness of the two concentric clutch-collars G H, so that the clutch-collars F, can gear with either of the clutch-collars G H, or with both at the same time. The case I, surrounds the spring E, and the teeth of all the clutch-collars F G H.

To the upper side of the case I, is attached a pin J, against the opposite sides of which rest the springs K, so as to hold the case in a central position and the ratchet-wheels H, out of gear, and to bring the case into a central position when it is released after being moved in either direction. The springs K, are attached at one end to the car-body A, and their other ends rest against the opposite sides of a pin L, also attached to the car-body A, and which serves as a bearing-point for the springs K, when under tension, and as a stop to prevent the springs from carrying the case I, beyond the central position.

To the upper and lower sides of the end parts of the cases I, or to the screws that connect the clutch-collars H, with the cases, are attached the ends of pairs of rods M, to prevent the case I, from being turned by a strain upon the clutch-collars H.

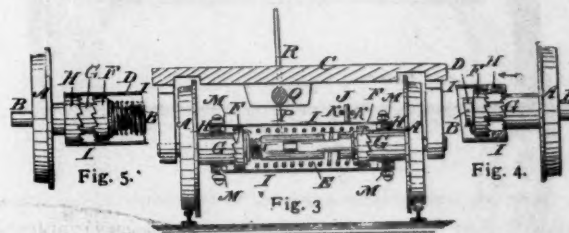
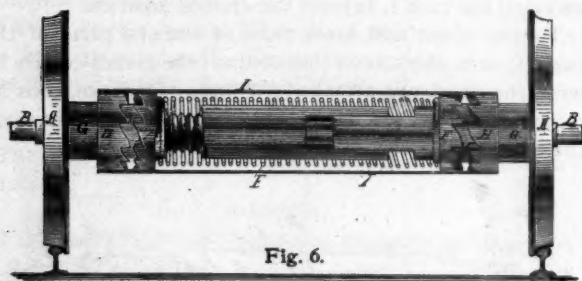


Fig. 3.
WITMER'S CAR-STARTER.

To the case I, is hooked or otherwise hinged the end of a rod O, the other end of which is hinged to the lower end of an arm P, rigidly attached to a shaft Q. The shaft Q, is placed longitudinally with the car, and works in bearings attached to the body C, of the car. To the ends of the shaft Q, are attached upwardly-projecting arms R, which may be made long, to serve as levers for the driver to take hold of when operating the mechanism; or the arms R, may be made short to receive a detachable lever, which can be transferred from one end of the car to the other, according as the horses are to be attached to one or the other end. It will be observed that the teeth of the clutch-collars F, project in opposite directions, so that one can be used while the car is going in one direction, and the other when the car is going in the other direction, as shown in Fig. 6, a device whereby is accumulated and held for future use the momentum of the car in such manner as to start the car in either direction or in assisting to ascend a grade, etc. Upon the middle part of each axle B, is placed a loose sleeve D, around which is coiled a spiral spring E, the sleeve preventing friction between the spiral spring E, and the axle B, when the spring is put under tension. The ends of the spiral spring E, are attached to clutch-collars F, placed loose upon the axle B, and the teeth of which when the clutch-collars are left

free, are held in gear with the teeth of the clutch-collars G, permanently attached to the end parts of the axle B, so that the two clutch-collars F, and the spiral spring E, will be carried around by and with the axle B, in its revolution. Upon the clutch-collars G, are placed clutch-collars H, which are permanently attached to a tubular case I, and are thus rigidly connected together, so that when one of the clutch-collars H, is in gear with one of the clutch-collars F, the other clutch-collars H F, must be out of gear. The clutch-collars F, equal in thickness the combined thickness of the two concentric clutch-collars G H, so that the clutch-collars F, can gear with either of the clutch-collars G H, or with both at the same time. The case I, surrounds the spring E, and the teeth of all the clutch-collars F G H.

In operating this device the clutch-collar F, is moved inward in precisely the same manner as in the inventor's first patent; but it carries with it the section of the sleeve to which it is attached, closing the arms of the one upon those of the other until they are completely interlocked (it should be remarked that they are never entirely un-



WITMER'S CAR-STARTER.

locked), when the whole sleeve is moved toward the clutch-collar F', the screw-sleeve of which engages completely with the main sleeve which locks the wheels. The screw is never entirely free from the sleeve, having a plain cylindrical end, which connects it with the sleeve when the screw is disengaged. Throwing the clutch-collar F, back to its original position stores the required momentum, and still permits the car to be moved. Moving the clutch F', inward brings into action the stored momentum for moving the car. To allow of the action of the device when the car is moving in an opposite direction, the whole action of the clutches, as just described, is reversed.

In using the entire mechanism, when the car is to be stopped the shaft Q, is turned to one or the other side by means of the lever R, which moves the cases I, brings the clutch-collars H, upon one side into gear with the clutch-collars F, pushes the clutch-collar F, out of gear with the clutch-collar G, and holds one end of the spiral spring E, stationary, so that the spiral spring E, will be coiled by the revolution of the axles B, until the car is stopped by the resistance of the springs E. When the car has been stopped, or when sufficient tension has been given to the springs E, the lever R, is released, and the springs K, bring the cases I, back to a central position. As the clutch-collars H, move back, the clutch-collars F, follow them until they come into gear with the clutch-collars G, which hold the clutch-collars F, and thus keep the springs E, coiled. When thus arranged the car can be run for any desired distance without affecting the springs E.

When the car is to be started the lever R, is moved in the other direction, which brings the clutch-collars H, upon the other side into gear with the other clutch-collars F, and pushes the clutch-collars F, out of gear with the clutch-collars G, so that the tension of the spring E, will revolve the axles B, forward and start the car.

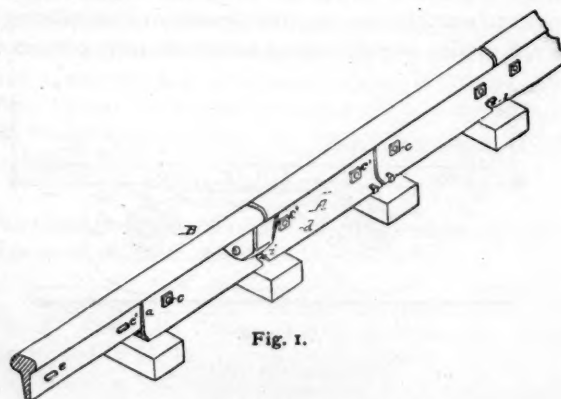
When the starter is to be used for assisting the horses in ascending a steep grade, or in running around a curve at a street corner, the lever R, is occasionally operated to gradually coil the springs E, as the car has sufficient momentum to allow this to be done without checking the advance of the car, or when upon a down grade. Then as the car approaches the upper or steeper part of the grade or street corner, as the case may be, and the horses need assistance, the lever R, is reversed to cause the tension of the springs E, to give a forward impulse to the car.

One special and valuable feature of this invention is that in muddy or rainy weather, the car missing a crossing by a few feet, as often happens, is entirely under the control of the driver, who can, by use of the lever, propel the car either backward or forward the necessary distance.

It is claimed for this form of car-starter that it is simple, durable, and effective, and while answering all the purposes for which it is intended will wear well, is not liable to derangement, and fully answers to the various tests to which it would be exposed in actual use.

Bargion's Railway-Rail.

PETER BARGION, of Black Diamond, Cal, is the inventor of an improved railway-rail, which is herewith illustrated and described. The invention relates to that class of compound-rail in which the lower rail is provided with flanges for receiving the central flange or web of the upper section, the object of the invention being to prevent the creeping of the rail.



BARGION'S RAILWAY-RAIL.

In the accompanying cuts, Fig. 1, is a perspective view illustrating the invention; Fig. 2 a cross-section, and Fig. 3 sections of the parts detached.

The rail consists of the lower section A, of iron, and the upper section B, of steel, the former having two upright flanges *a a*, with inclined inner faces, inclosing a recess *x*, contracting toward the bottom. The central web or flange *b*, of the section B, is not so deep as the recess *x*, the sides correspond in angle to the faces of the recess, and the width is such as to fill completely the recess, so as to permit no lateral movement. When the

section B, is applied to the section A, the web b , being if anything slightly wider than the recess x , will be forced so tightly between the flanges a , as to prevent lateral motion. Owing, however, to the taper of the web and recess, this close fitting of the parts is not effected until the shoulders $y y$, of the head are directly upon their permanent bearings at the edges of the flanges. When, therefore, a train is upon the rail, the head is directly supported by the flanges a , while there is no springing or jumping of the section B, and no rattling resulting from the striking together of the parts. Each section B, is bolted immovably to one end of the section A, below by bolts $c c$; but the bolt-openings $e e'$, in the opposite end of the section B, which is supported by the adjacent section A, are elongated for the passage of the bolts $c' c'$, so that the sections are securely bolted together, while the slight longitudinal movement of the upper or lower sections is not prevented, so there is no "buckling" from the expansion of any part of the rail.



BARGON'S RAILWAY-RAIL.

In order to prevent that creeping of the rails upon the sleepers, apt to result when the rail is in two sections of materials expanding unequally, especially when the road is inclined, a notch z , is formed in the center of the lateral flange d , so that the section A, may be spiked immovably at the center of the sleeper. The other spikes merely overlap the flange, so that each section can expand equally in both directions. As the upper sections are arranged to break joint with the lower sections, it will be apparent that the expanding of the free ends of the sections below each upper rail, being in opposite directions, will tend to prevent any movement of the upper sections, while as each section B, is secured immovably at one end to the lower section, no independent creeping of the upper sections can take place.

It is claimed for this form of rail that it is durable and economical, and prevents effectually the creeping of rails; and forms a continuous, jointless track, thus securing a minimum of friction and no "hammering," while all splices, fish-joints, and shoes are done away with, resulting in less wear and tear to rolling-stock, and uniting increased speed with safety and economy. The device is now controlled by R. S. Bevier, of Owensboro', Ky., to whom all communications should be addressed.

Bellamy's Spring-Cushioned, Hoof-Expanding, Frog-Pressure Horse-Shoe.

LUTHER HALL BELLAMY, of Brockville, Ontario, Can., is the inventor of a new form of horse-shoe, which is here-with illustrated and described. The invention provides a ready-made horse-shoe which will fully care for all the wants of foot, preserve the natural elasticity of the frog and heel, remove or prevent contraction of the hoof, and as nearly as possible resemble the tread of the natural foot. In order to attain these objects the shoe is con-

structed on scientific principles, so as to distribute the resistant pressure properly over the weight-bearing surfaces of the foot and strictly maintain its natural action and form, and to prevent slipping and the lateral rolling of the foot, which so often causes cutting and interference. Another very important object is to allow perfect knee action, and yet so take the shock of concussion as to avoid all injury to foot or leg, and afford positive relief to the lame or tender-footed horse, and, lastly, to provide for the natural expansion of foot.

In the accompanying cuts, Fig. 1 is a plan view of the bottom of shoe; Fig. 2 a side elevation, and Fig. 3 a rear view in elevation.

A represents the web of the shoe, having nail-holes a , and curved inwardly-projecting ends $a' a'$, at the rear. B represents the usual toe-calk. C C are side-calks, D D the heel-calks, and E E the frog-calks. In front of the toe-calk B, is projected a portion b , of metal, to contain a nail-hole, so as to make a secure fastening where the shell of foot is strongest and can best stand the lateral as well as the backward strain on the nail. The toe-calk B, is



Fig. 1.

BELLAMY'S SPRING-CUSHIONED, HOOF-EXPANDING, FROG-PRESSURE HORSE-SHOE.

also enlarged at $b b$, so as to provide for the greater wear at these points over the center, and thus cause them to wear off in a horizontal plane.

The side-calks C C, are rocking-calks, located on the web midway between the usual toe-calk B, and heel-calks D D, while the calks E E, on the inwardly-curved rear ends support that part of the web which forms the spring-bearings for frog and cushion for foot. It will thus be seen that seven bearings for the web are provided, namely, one toe-bearing, two side-bearings, two frog-bearings, and two heel-bearings.

In order to prevent the lateral movement of foot, and guard against interfering, lessen the chances of stumbling, and obtain a forward rocking movement of foot at each step, the toe-calk is made shorter than the side-calks, so as to form a slight clearance at toe, and also automatically adapt the tread to the inequalities of road, so that

the hard pavement may feel like natural ground; and in order to obtain frog-pressure the frog-calks are made longer than the adjacent heel-calks, so as first to come in contact with road or pavement. Thus the principal bearing or pressure will be on the frog and side-calks until the full weight of the horse causes the frog to yield to the springing projections E E, when the heel-calks D D, will reach the pavement, thus bringing the lower ends of the



Fig. 2.

BELLAMY'S SPRING-CUSHIONED, HOOF-EXPANDING, FROG-PRESSURE HORSE-SHOE.

heel, side, and frog-calks in the same horizontal plane while that of the toe-calk remains in a higher horizontal plane, so as to allow for the rocking movement of foot at each step, which not only provides a yielding or spring cushion to imitate nature and secure the frog-pressure necessary for health of foot, but also maintains the natural level of foot, prevents the side and forward slip, allows for, the natural expansion of foot, and obtains the forward



Fig. 3.

BELLAMY'S SPRING-CUSHIONED, HOOF-EXPANDING, FROG-PRESSURE HORSE-SHOE.

rocking movement in an easy, natural, and safe way, all tending to greatly improve the knee action and enable the horse to travel on any kind of road with the greatest possible safety and comfort.

It is claimed by the inventor that this device provides a very light and durable shoe, which, being made by machinery, gives accuracy of foot-bearing, fineness of finish, and uniformity of shape; while the cramped movement and shortened step of the horse resulting from the contracted hoof produced by the ordinary horse-shoe, is entirely obviated by this improvement, which provides for expansion of foot, lengthens the step, and produces light and elastic movement.

Broun's Means for Locking Bolts.

NICHOLAS H. BROUN, of Mobile, Ala., is the inventor of an improved means for locking bolts, which is here-with illustrated and described. The object of the invention is to provide means for effectually locking the bolts, which means shall at the same time be inexpensive and durable; and it consists in a series of lugs or projections formed on the face of one section of a fish-plate, so located that when the fish-plate is in close adjustment on the rail the angular heads of the bolts will rest in contact with the lugs and prevent the bolts from turning and fish-plate section from sliding. It further consists in a fish-plate having one section provided with threaded bolt-holes, and the opposite section provided with oblong slots for receiving the bolts, and lugs or projection adapted to slide with the fish-plate beneath the bolt-heads. It further

consists in a set of lugs or projections formed on one section of a fish-plate and adapted to form a stop for the rotary motion of the bolt-head, in combination with a set of round bolts, whereby the tendency of the bolt to turn will be increased, and the lock thereby made more effectual.

In the accompanying cuts, Fig. 1 is a view in side elevation of the adjacent ends of two rails secured by a fish-plate and bolts, showing the improved means for locking the bolts; Fig. 2 a view in side elevation of the opposite side, and Fig. 3 shows the locking section of the fish-plate in position to allow the bolts to turn.

A A' represent the adjacent ends of two consecutive rails. B represents the bolt-locking section of the fish-plate, and b the opposite section of the fish-plate. The

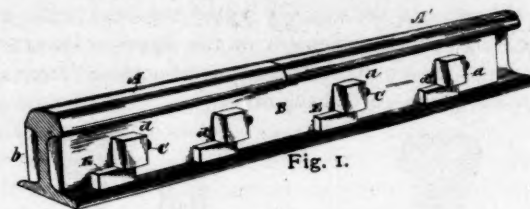


Fig. 1.

BROUN'S MEANS FOR LOCKING BOLTS.

section b, is provided with a series of screw-threaded perforations c, which are adapted to receive the threaded ends of the bolts D. The section B, of the fish-plate is provided with a series of oblong slots C, corresponding to the threaded perforations c, which slots are sufficiently wide to admit the bolts D, and long enough to allow the section B, to slide longitudinally thereon a distance equal to about half the diameter of one of the bolt-heads d. The bolt-heads d, are preferably square, but may be of other angular shapes, if found desirable. The section B, is further provided with a series of lugs or projections E, located below and to one side of the slots C. The projections E, are located on the left-hand side of the slots, or on that side toward which the upper portions of the bolt-heads turn in unscrewing. The upper faces of the projections E, are level, and are located a distance below the centers of the slots C, equal to the distance from the

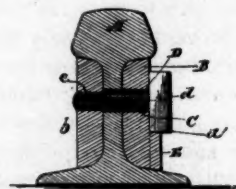
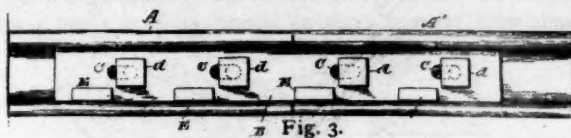


Fig. 2.

BROUN'S MEANS FOR LOCKING BOLTS.

center of one of the bolt-heads to the middle of one of the sides of the bolt-head. When the section B, is slid toward the left, with the bolts in the extreme right-hand ends of the slots C, the ends of the projections E, will be far enough from the bolt-heads to admit of the free use of a wrench, and in this position the bolts may be screwed into the fish-plate section b. When the bolts are screwed home and left with one of their sides, the lowest side, parallel with the tread of the rail, or with the face of its lug, the section B, may be driven to the right, sliding the lugs E, beneath the bolt-heads until the bolts occupy the extreme left of the slots C. It will be observed that the

bolt-heads, and hence the bolts, are now absolutely locked against a rotary motion toward the left as long as the lugs occupy their present positions, and as the tendency of the bolts is constantly to turn toward the left, or unscrew, the left-hand lower corners *d'*, of the heads will impinge against the faces of the lugs *E*, and tend to hold the section *B*, from sliding toward the left, and, in case there should be any play left between the faces of the lugs and the bolt-heads, would tend to slide the section *B*, toward



BROUN'S MEANS FOR LOCKING BOLTS.

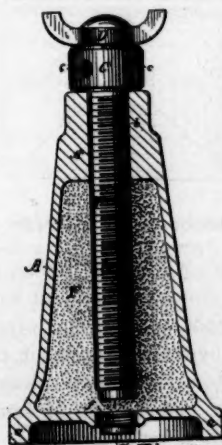
the right. It is evident that the greater the tendency of the bolt to unscrew, the more securely will the section *B*, be locked against displacement. To enable the bolts to have a stronger tendency to unscrew, they are made round instead of angular.

The advantages of the above-described means for locking the bolts consist in the saving of loose nuts on the ends of the bolts, the convenience with which the fish-plates are adjusted and removed, the small number of parts employed, and the perfect freedom from wear on the parts, and finally the absolutely sure and permanent locking of the bolts.

The device is now controlled by the inventor and by George A. Pearce, of Mobile, Ala.

Chapman's Lifting-Jack.

THOMAS L. CHAPMAN, of Richmond, Va., is the inventor of a new and improved form of lifting-jack, which is herewith illustrated and described. This device belongs to that class denominated "lifting-jacks;" and the novelty consists in the peculiar construction of the device in its several parts and in the device as a whole, all as will now



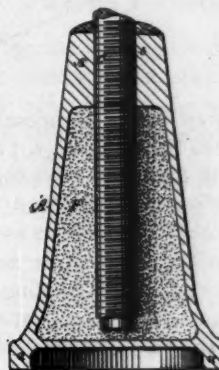
CHAPMAN'S LIFTING-JACK.

be more fully set out and explained, reference being had to the accompanying cuts.

In the accompanying cuts, Figs. 1 and 2 represent vertical central sections of the present invention.

A denotes the body of the jack, which is usually of a generally triangular shape from top to bottom—that is, it

is larger in diameter at the base than at the top. Centrally through the upper part *A'*, of the body is the screw-threaded aperture *b*, in which the screw *C*, is moved, and in the lower part of the body is the chamber *F*, of any desired shape or size. This chamber is denominated the "grease-chamber," because it is filled with any desired lubricant, and this is preferably done through the aperture *f*, in its base, which aperture is suitably closed by a plug, cover, or screw-cap *f'*, or the filling-aperture may be at the side. In some forms of construction it may be found desirable to fill this chamber through the screw-hole in the top, the chamber being otherwise closed. Circumferentially about or around the base is a flange *a*, on which the jack rests; but the jack may be so made as to rest on a flat bottom, the under side of the bottom of the grease-chamber being recessed or counter-sunk to take the screw-cap or cover or plug of the filling-aperture. The head *C'*, of the screw is provided with the usual apertures *c*, and on its upper end there is the usual swiveling head *D*.



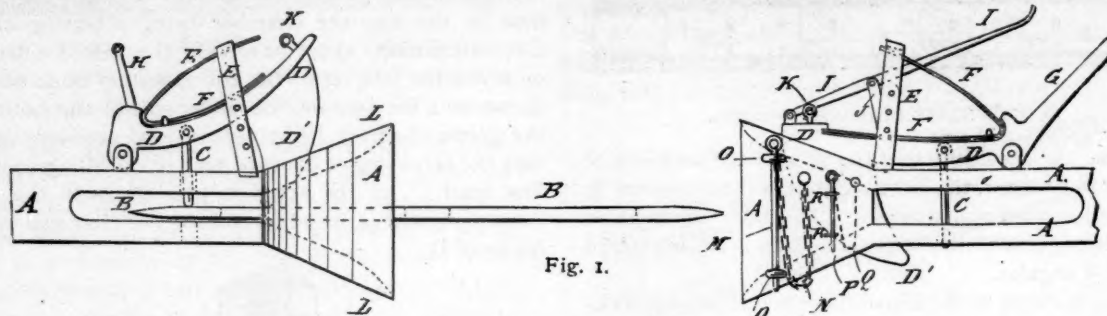
CHAPMAN'S LIFTING-JACK.

The operation of the lifting-jack is as follows: The grease-chamber having been properly filled and the screw placed in its hole or socket, it is only necessary to screw it up and down once or twice to thoroughly lubricate its entire thread and the socket, and if at any time it is necessary to further lubricate the screw-thread or socket the operation is repeated; but generally the mere use of the screw will keep its socket and the whole stem suitably lubricated. In ordinary construction it has been found very difficult to keep the screw of a lifting-jack well lubricated, so as to be in good working order for any considerable time. This has chiefly happened because the body of the jack being open a considerable part of the screw has been exposed to the air. Thus in cold weather the grease would harden, in hot weather it would run off, and in dusty weather it would get grimed. In addition to these objections, any exposure of the jack will soon cause the screw to rust; but it is claimed that in the present device all these difficulties are fully obviated, and the screw is always in good working order. Nor does the present construction add in any perceptible manner to the weight or cost of the device, while in all details of use it is adapted to every purpose required of a lifting-jack, and its real value as a tool or implement very greatly increased.

The inventor has assigned a one-half interest in his patent-rights to Clinton Lloyd, of Williamsport, Penn., to whom all communications should be addressed.

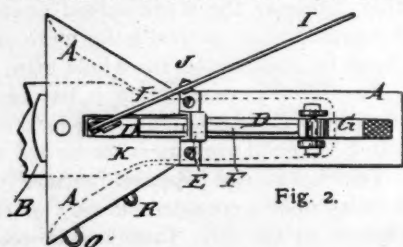
Ingersoll's Car-Coupling.

CHARLES M. INGERSOLL, of Summit Hill, Pa., is the inventor of a new form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a side elevation of one of the car-couplings shown uncoupled; Fig. 2 a plan view of one part of the same, part of the link being broken away; Fig. 3 a front elevation of a part of the same; Fig. 4 a sectional side elevation of a part of the same, and Fig. 5 a plan view of the coupling bar or link.



INGERSOLL'S CAR-COUPLING.

A represents the draw-heads, the mouths of which are made hopper-shaped, as shown in Figs. 3 and 4, and indicated in dotted lines in Fig. 1. The shanks of the draw-heads A, are slotted longitudinally and horizontally, to allow the ends of the coupling-bar B, to have a free lateral movement, and the height of the slots are made enough greater than the thickness of the coupling-bar B, to allow the ends of the coupling-bar B, to have the necessary vertical play. C are the coupling-pins, which pass down through holes in the shanks of the draw-heads A, and through slots in the end parts of the coupling-bar B. The upper ends of the coupling-pins C, are pivoted to latches D, at a little distance from their rear ends, so that the pins will be raised and lowered by the up and down movements of the latches. The latches D, are pivoted at their rear ends to lugs formed upon or secured to the upper sides of the shanks of the draw-heads A, and their forward



INGERSOLL'S CAR-COUPLING.

ends extend nearly to the forward ends of the draw-heads. Upon the lower sides of the forward ends of the latches D, are formed downward projections D', the inner edges of which are concaved, and their outer edges are convexed, giving to the projections a hook form, as shown in Figs. 1 and 4.

The projections D', of the latches D, work in slots in the upper and lower parts of the draw-heads A, and the latches D, are made to move up and down in vertical planes by keepers E, attached to the upper sides of the draw-heads, and are held down by V-shaped springs F, which are secured at or near their angles to the rear parts

of the latches D, with their lower arms resting upon the upper sides of the latches, and with the ends of their upper arms passing through the upper parts of the keepers E, and bearing against the bends of the keepers. With this construction, when two cars are run together the entering end of the coupling-bar B, strikes against the convexed forward edge of the projection D', and raises it and the latch D, and pin C, passes in beneath the lower ends of the projection and pin until they drop through the slot in the coupling-bar B. The coupling-bar B, is made with tapered ends, as shown in Figs. 1 and 4, and

the ends are made solid for such a distance that the ends of the projections D', will rest upon the ends until the ends have passed beneath the lower ends of the coupling-pins C, which then rest upon the solid ends until they slide off into the slots of the coupling-bars, and the cars are coupled, the draft-strain coming wholly upon the coupling-pins C.

The center of the coupling-bar B, is made solid, to give it the necessary strength, and the middle part of the bar is widened and has the ends of the widened part beveled, to correspond with the flare of the mouths of the draw-heads, so that the distance to which the coupling-bar

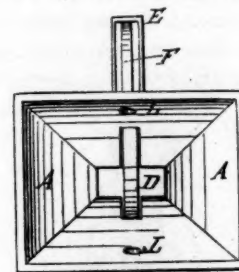


Fig. 3.

INGERSOLL'S CAR-COUPLING.

enters the draw-heads will be limited by the widened part of the coupling-bar coming in contact with the inner surface of the draw-heads. Upon the pivoted rear end of each latch D, can be formed, or to it can be rigidly attached, an arm G, to serve as a foot-lever for raising the latch D, to uncouple the cars, or an arm H, to receive a chain connected with a lever pivoted to the front of the car-body; or to the forward end of the latch D, can be pivoted the forward end of a lever I, the middle part of which is pivoted to a standard J, attached to the shank of the draw-head; or to the forward end of the latch D, can be attached an eyebolt K, to receive a chain connected with the top of the car-body, or to serve as a handle for raising the latch and uncoupling the cars.

A hole L, is formed through the forward part of each

draw-head A, to receive an ordinary coupling-pin M, when it is necessary to couple a car provided with the improved coupling with a car provided with the ordinary pin-and-link coupling. The coupling-pin M, is connected with the draw-head A, by a short chain N, so that it cannot be lost, and when not required for use is inserted in keepers O, attached to the side of the draw-head A.

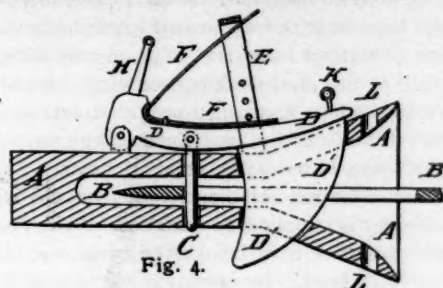


Fig. 4.
INGERSOLL'S CAR-COUPLING.

When it is desired that cars may be run together without coupling, the latch D, and pin C, are secured in a raised position by a pin P, inserted in a hole formed in the keeper E. This pin P, is connected with the draw-head A, by a short chain Q, to keep it from being lost, and when not required for use is inserted in keepers R, attached to the side of the draw-head A.



Fig. 5.
INGERSOLL'S CAR-COUPLING.

It is claimed for this form of car-coupling that it is simple, durable, and inexpensive, and not liable to derangement. It will couple automatically irrespective of the speed of the cars in coming together, and on curves or grades. The moment cars are uncoupled the device assumes the position to couple again automatically without readjustment of its parts, and will never accidentally uncouple.

Morse's Nut-Lock.

JAMES F. M. MORSE, of Evansville, Ind., is the inventor of an improved form of nut-lock, which is herewith illustrated and described. A chief object of the device is to provide a nut-lock that will admit of the frequent adjustment of the nut without injury to the lock.

In the accompanying cuts, Fig. 1 represents a side elevation of a bolt and nut with the nut-lock attached; Fig. 2 an end view of the same; Fig. 3 a central longitudinal section at a right angle to Fig. 1; Fig. 4 a view in perspective of the parts of the lock separated, and Figs. 5 and 6 represent modifications of the device.

A short portion *b*, of the outer end of the bolt is reduced and made angular in section. *c* is a washer adapted to pass over the bolt and to embrace the nut on two sides. *d* is a flat plate having a central perforation *j*, corresponding in size and outline to the angular portion *b*, of the bolt, and adapted to interlock with the projecting ends of the washer *c*. In Figs. 1, 2, 3 and 4 the washer *c*, is provided with arms *e* and *f*, which lie normally close along two opposite sides of the nut *g*, and project out-

ward beyond the face of the nut. These projecting ends of arms *e* and *f*, are notched on each edge, so as to form T-shaped heads, which pass through corresponding slots *h* and *i*, in the plate *d*, and engage the plate on the outside.



Fig. 1.

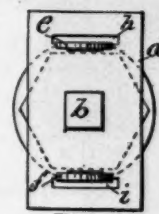


Fig. 2.

MORSE'S NUT-LOCK.

In operation, the nut is placed between the arms of the washer *c*, and is then screwed onto the bolt, the washer turning with the nut. When the nut has been screwed down sufficiently, the plate *d*, is slipped over the project-

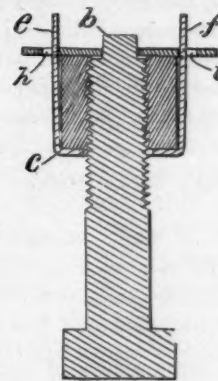


Fig. 3.

MORSE'S NUT-LOCK.

ing ends of the arms *e* and *f*, and the squared portion *b*, of the bolt, the arms being forced slightly apart, so as to enter the wider portion of the slots in the plate, and then springing toward each other into the narrower portion of

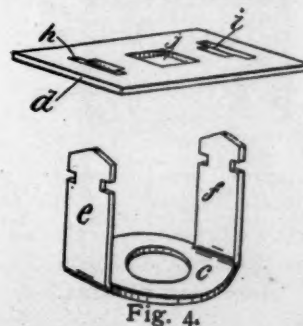


Fig. 4.

MORSE'S NUT-LOCK.

the slots when the plate has reached the notched portion of the arms. The nut is thus held in position by the engagement of the arms with the plate, which is held in a fixed relation with the bolt by the engagement of its central hole *j*, with the squared portion of the bolt. When

the nut is to be again turned, it is only necessary to release the hold of the arms upon the plate *d*, when the plate may be removed.

In the modification of the device as shown in Fig. 5, the ends of the arms *e* and *f*, instead of being notched to engage with the plate *d*, are simply bent outward, as shown, thus retaining the plate on the bolt. In Fig. 6

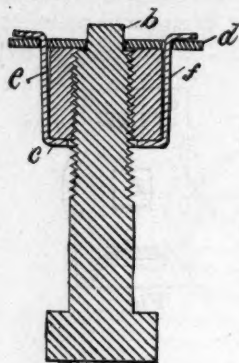


Fig. 5.

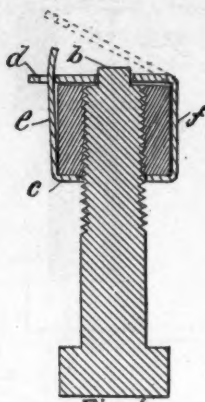


Fig. 6.

MORSE'S NUT-LOCK.

the plate *d*, is shown as formed integral with one of the arms of the washer *e*, and interlocked with the other arm. In this case, when the nut is to be turned, the plate is bent outward, as indicated by dotted lines.

This device is claimed by the inventor to provide a simple, durable, inexpensive and reliable nut-lock.

Peet's Ticket-Holder.

WARREN L. PEET, of Maple Rapids, Mich., is the inventor of a new and improved form of ticket-holder, which is herewith illustrated and described. This invention relates to ticket-holders, and has for its object to provide a simple and convenient form of ticket-holders for railway-cars.

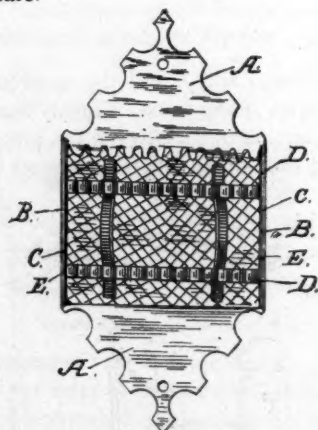


Fig. 1.

PEET'S TICKET-HOLDER.

In the accompanying cuts, Fig. 1 is a front view, and Fig. 2 a plan view of the device.

In carrying out the invention a main or back plate *A*, is provided, the opposite side edges of which are bent slightly, forming flanges *B*, as most clearly shown in Fig. 2. The ticket-support is formed with the wings *C C*,

preferably bent from a single plate of perforated metal, or suitable open-work, as shown in Fig. 1, into the triangular form (more clearly shown in Fig. 2) and having its edges placed against the flanges *B*, and soldered or otherwise suitably secured thereto. In use the back-plate is secured to the inside of the car, and the wings *C C*, face in different directions, as shown. Strips *D D*, of crimped metal, are secured at each end to the ticket-holder, and in horizontal lines near the upper and lower ends thereof. These strips *D*, extend from the joint of one wing with the main plate to the joint of the other wing therewith, as shown. Vertical strips *E*, are also provided, arranged one midway the sides of each wing. Each of the strips *E*, is secured to its respective wing in such manner that its central portion is bulged sufficiently out from the wing.

A ticket-holder is supplied to each seat of the car, and arranged so that they may be conveniently seen by the conductor at all times. By crimping the strips *D*, and attaching them to opposite edges of the wings, sufficient

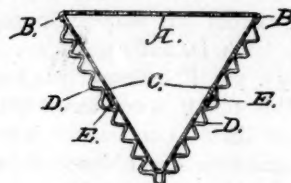


Fig. 2.

PEET'S TICKET-HOLDER.

play may be had for the insertion of the vertical strips *E*, which may or may not be of spring metal, and for the insertion of the tickets between the wings and the strips, the folds of the strip expanding to allow it to accommodate itself to the bulk of the tickets. As the strips *E*, which may be of any desired number not exceeding the number of folds in the strip *D*, are held between the folds of the latter, they are caused to retain their relative positions, and prevented from having any lateral movement. The strips *E*, being bulged, afford an easy means of grasping the same when it is desired to insert a ticket between them and the wings. Furthermore, this bulge prevents the slipping or vertical displacement of the strips, as will be readily understood from Fig. 1.

It is claimed for this invention that it is simple in construction, and may be made at slight cost. By its use the passenger may at all times have his ticket or check in view, and the inconvenience of being repeatedly asked to exhibit same is obviated.

Muddiman's Hose-Coupling.

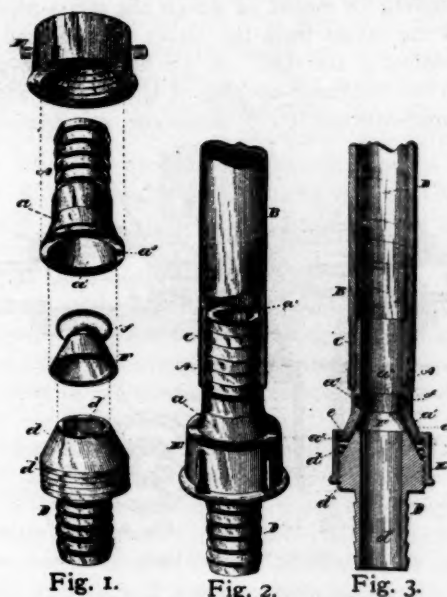
CHARLES A. MUDDIMAN, of Washington, D. C., is the inventor of a new form of hose-coupling, which is herewith illustrated and described. The object of the invention is to enable a joint to be easily and quickly made between sections of a hose, or between a hose and a plug; and to this end consists in the construction and combination of parts, substantially as and for the purpose herein-after shown.

In the use of hose for liquids it has heretofore been customary, in connecting two pieces together, or when connecting the hose with a plug, to employ couplings having square abutting ends, and to depend upon an elastic washer placed between the same for the production

of a joint; but such means have proved defective, especially in connection with hose employed for watering lawns, sprinkling streets, etc., which is usually manipulated by inexperienced persons.

In the accompanying cuts, Fig. 1 is a perspective view of the parts of the coupling separated from each other; Fig. 2 is a like view of the same united; Fig. 3 is a central longitudinal section of the coupling; Fig. 4 is a perspective view of a supplemental plug for use upon the plug of an ordinary street-washer or hydrant, and Fig. 5 is vertical central section of the same.

In the carrying of the invention into practice a thimble A, having the usual grooved periphery is inserted into the end of a hose B, and confined therein by wire C, wound around the exterior of said hose, or by any other means ordinarily employed. The projecting end a , of the thimble A, has a general bell shape, and within its interior is provided with a conical face a' , that at its inner end is merged in the axial opening a^2 , of the sleeve. The opposite



MUDDIMAN'S HOSE-COUPLING.

thimble, or if part of a hydrant, the plug D, has a conical face d , formed upon its end, which face corresponds to and is adapted to fit within the conical face a' , whereby the axial opening d' , within the plug will be caused to coincide with and form a continuation of the opening a^2 . The periphery of the plug D, is somewhat larger in diameter than the end of the thimble A, and is provided with a screw-thread d^1 , and over the same is fitted a sleeve E, which is threaded interiorly. Said sleeve is swiveled upon the thimble A, in the usual way, the latter being provided at its end with a radially outward projecting flange a^3 , that is engaged by a radially inward projecting flange e , which is formed at the upper end of the sleeve. If, now, the hollow conical end of the thimble A, is placed over or upon the conical end of the plug D, and the sleeve E, screwed down around the latter, the parts will be firmly bound together, and their bearing-faces a' and d , will be held in contact.

In order that a tight joint may be formed between the thimble A, and plug D, a rubber washer F, is placed between the faces a' and d , which conforms to the shape of

the faces, and by the action of the sleeve E, is compressed between the same. To prevent displacement and loss of the washer F, it is loosely attached to the thimble A, by means of a rib f , that is formed upon the periphery at the upper end of the washer, and fits into a corresponding circumferential recess a^4 , which is provided within the axial opening a^2 , of the thimble. Thus constructed, the washer may be readily placed in or removed from position when desired, as its enlarged part is easily compressed while passing through the neck of the recess a^4 ; but the connection between the parts is sufficient to prevent their accidental separation during any ordinary use of the hose.



Fig. 4.

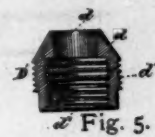


Fig. 5.

MUDDIMAN'S HOSE-COUPLING.

It will be seen that, if desired, the elastic washer F, may be readily attached to the plug D, instead of the thimble A, for which purpose it will only be necessary to provide a rib at the lower end upon the inner side of the washer and a corresponding groove within the periphery of the plug.

For use with an ordinary street-washer, a supplemental plug D', as shown in Figs. 4 and 5, is employed, which is like the plug D, before described, except that instead of the grooved lower end for insertion within a hose the plug D', has within its lower portion a threaded interior d^2 , that is adapted to fit over the plug of such street-washer. The plug D', after having been placed in position, need not be removed with the hose.

It is claimed for this form of hose-coupling that it is simple, effective, and economical, and is equally well adapted for use in connection with either steam, air, oil, or water.

Chandler's Dressing-Closet for Sleeping-Cars.

ADONIRAM J. CHANDLER, of Cincinnati, Ohio, is the inventor of an improved and novel form of dressing-closet adapted for use in sleeping-cars, which is herewith illustrated and described. The object of the invention is to provide a shelter or screen for use upon sleeping-cars of

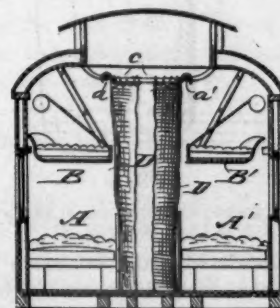


Fig. 1.

CHANDLER'S DRESSING-CLOSET FOR SLEEPING-CARS.

the Pullman model, whereby the occupants may stand upright in the aisle and dress without being within sight of other passengers; and the invention consists of a supporting-frame carrying curtains, said frame being so ar-

ranged that it may readily be attached to or disconnected from the curtain-rail of the car, and of certain details of construction and combination of parts, to be hereinafter described, and specifically pointed out.

In the accompanying cuts, Fig. 1 is a vertical cross-sectional view of the body of a sleeping-car, representing the dressing-closet as applied thereto; Fig. 2 a perspective view representing a portion of a section with the closet in position for use, and Fig. 3 a similar view representing the frame as detached or unlocked from the curtain-rail across the aisle from the entrance to the closet.

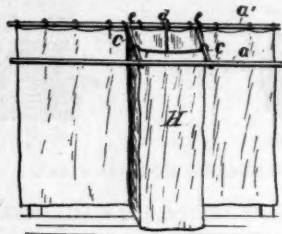


Fig. 2.

CHANDLER'S DRESSING-CLOSET FOR SLEEPING-CARS.

Referring now to the construction shown in Fig. 1, A A' represent the lower, and B B' the upper berths of an ordinary sleeping-car, before which the usual curtains are hung from the rails a a'. In the ordinary and usual form of construction it is very difficult for passengers to dress and undress without exposing themselves to the view of their fellow-travelers, as the dressing must be done in the open aisle or in the berth, which, as is well known, is very inconvenient.

The closet consists of a curtain D, of any proper material, that is secured to the rods C, as shown in Fig. 2, and provided with hooks e e, and hooks e e, being at the ends of the rods and arranged so that they may be caught upon the curtain-rail a', that is above the section containing the travelers who wish to use the closet. When placed as described, the opening d, will be sufficient to allow a person to enter the closet, but, being toward the vacated

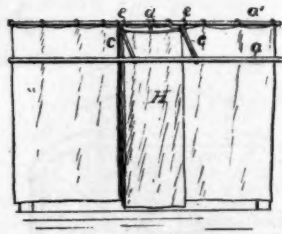


Fig. 3.

CHANDLER'S DRESSING-CLOSET FOR SLEEPING-CARS.

berth, will not interfere with the seclusion thereof, and after the sections are made up the closet may be suspended from rail a', as shown in Fig. 3.

Instead of a rod c, the top of the closet might be made from a circular board provided with hooks arranged so as to correspond relatively with the hooks e e. During the day the closet may be taken down and packed away with the mattresses.

It is claimed for this form of dressing-closet that it is simple, and inexpensive of construction, and effects a far

more comfortable opportunity of dressing in transit than any method hitherto used, as it supplies each section with a practically distinct and separate dressing-room. The patent is under the sole control of the inventor, to whom all communications should be addressed.

Desmond's Injector.

THE object of the above invention, which is herewith illustrated and described, is to construct a new form of lifting injector composed of fewer parts, and of a simpler construction than any heretofore devised.

In the accompanying cuts, Fig. 1 is a vertical central longitudinal section of the injector, and Fig. 2 a cross-section on the line x x in Fig. 1.

A is the tubular main casting or shell of the injector. This is provided with inlet and discharge openings at the ends, and has the lateral branches B and C. D is a suitable coupling by means of which the steam-pipe which conveys the steam from the boiler is connected to the inlet-opening of the shell. E is a hollow screw-plug secured in the discharge-opening of the shell A, and forms a discharge-chamber P. F is another suitable coupling,

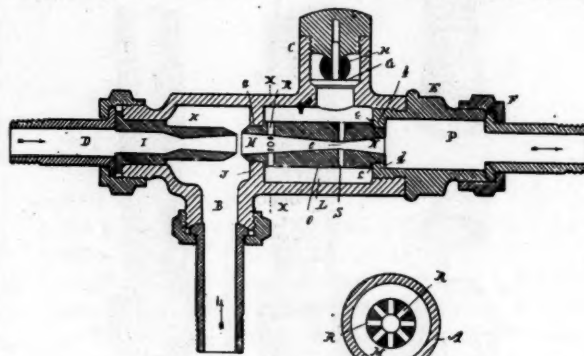


Fig. 1.

Fig. 2.

DESMOND'S INJECTOR.

by means of which the discharge end of the hollow screw-plug E, is connected to the feed-pipe, which conveys the feed-water into the boiler. The lateral branch B, forms the inlet-opening for the supply-water, and connects with the water-supply pipe to the well. The lateral branch C, forms a chamber and seat for the overflow-valve G, and is provided with the outflow H, for the overflow. I is the steam-nozzle, removably secured in the inlet-opening of the shell. J is a diaphragm-plate formed integrally with the shell A. It divides the chamber K, which communicates with the water-supply from the overflow-chamber L, which communicates with the overflow-outlet H, whenever the overflow-valve G, is raised off its seat. M is the combining-tube, and N is the discharge tube. These tubes are combined into one piece O, of cylindrical form, provided with necks a and b, at the ends.

The diaphragm-plate J, is provided with a central opening, into which the neck a, of the tube O, is fitted, so as to make the forward end of the combining-tube project slightly within the chamber K, and in proximity to and directly opposite and in line with the discharge end of the steam-nozzle. The neck b, of the tube O, is fitted into a corresponding opening of the flange-bushing d, which latter is formed at the inner end of the screw-plug

E, and packing *c*, may be used to form a tight joint. The cylindrical tube O, forms a dividing-wall between the annular overflow-chamber L, and between the combining-tube M, and delivery-tube N, through which the following passages are provided. Near the base of the combining-tube M, communication is established between the interior of the combining-tube and the overflow-chamber L, by means of a series of radial holes R, formed through the wall of the combining-tube as near its base as practicable. S is an overflow-passage formed through the wall of the tube O, and affording communication between the overflow-chamber L, and the throat *e*, which forms the intermediate connection between the combining-tube and discharge-tube.

The operation of the injector is as follows: Steam being at once fully admitted into the injector it will quickly force its way through the steam-nozzle into the combining-tube and from there through the passages R, into the overflow-chamber, and after raising the valve G, out into the air through the opening H. As there is an ample and free exit for the steam which passes through the steam-nozzle into the combining-tube, there will be a strong aspiration into the combining-tube and the water in the supply-pipe will be raised. If the distance is within the ordinary limit, the water will be raised into the water-chamber K, and from there be drawn through the combining-tube into the overflow-chamber, and escape through the opening H. As the velocity of the water in the combining-tube increases, the port S, in affording further relief, will throw the whole combining-tube into operation until the velocity of the water becomes sufficient to force it against the boiler-pressure, when the over-flow ceases, and the valve G, will close under the action of the vacuum created.

It is claimed for this invention that it is simple in construction, and can be readily and inexpensively manufactured. It is also claimed that it will keep its priming much longer than a more complicated device of the same character, and is adapted to use on all kinds of engines, especially traction and marine, where subject to severe jarring, there being no moving parts to get out of order.

At a recent test ordered by the United States Government at the Norfolk Navy Yard, a report was signed by S. D. Hibbert, chief engineer, and others speaking in high terms of the results of 31 days trial of this injector.

The device is now known as the Michigan Automatic Injector, and is entirely controlled by Roe Stephens, of Detroit, Mich., to whom the patent-rights have been assigned.

Gabel's Car-Coupling.

ALFRED N. GABEL, JR. and ARTHUR L. GABEL, of Onarga, Illinois, are the inventors of a new and improved form of car-coupling, which is herewith illustrated and described. The invention relates to an improvement in car-couplings, and it consists in the certain peculiarities of the construction and arrangement of the same, as are fully described below.

In the accompanying cuts, Fig. 1 is a perspective view of the coupling applied to a car, and Fig. 2 a longitudinal vertical section of the same.

a represents a car, and *a'* the draw-bar, both of which

are of ordinary and well-known forms. In the draw-bar is pivoted a hook *b*, for engaging the link, the rear end of which is extended beyond the pivot and rests upon a spring *b'*, which acts to throw the hook down and retain it in place, as shown. The forward end of the hook-arm is formed with shoulders *b²*, which fit into recesses *b³*, of

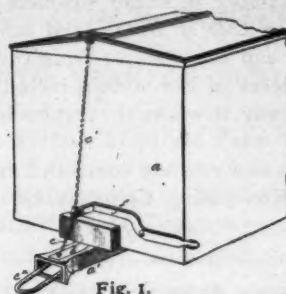


Fig. 1.

GABEL'S CAR-COUPLING.

the draw-head, and the point of this hook is formed with small notches *c*, which rest upon and receive the edge of the recess or hole *c'*, in the bottom of the draw-head, and effectually prevent any twisting of the hook under the action of the link. The forward side of the hook is rounded or beveled off to admit of the link *c²*, easily lifting the hook as it passes in, and in rear of the hook the draw-head is cast or formed with an abutment *d*, to pre-

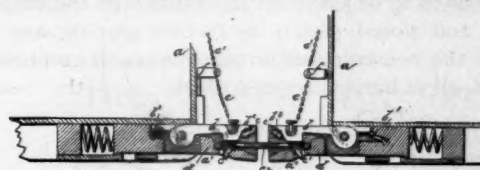


Fig. 2.

GABEL'S CAR-COUPLING.

vent the link going too far back. A chain *e*, is attached to the upper side of the hook and led to the end of a lever *f*, pivoted on the car-body within easy reach from the side, so that the operator need not pass between the cars and run any risk of accident. A second chain *e'*, is attached to the lever and extended to the roof of the car, to permit the coupling to be operated from that point. It will be seen that the link automatically lifts the hook as it enters, and it drops back by the action of the spring to couple the cars.

It is claimed for this form of car-coupling that it is simple, durable, and economical, and may be readily attached to any draw-head.

Neary's Process for Renovating Car-Seats, Etc.

GEORGE F. NEARY, of Brooklyn, N. Y., is the inventor of a new process for renovating car-seats and furniture, and upholstery of all kinds on railway and street-railway cars, steamships and hotels, and all public buildings. By this process the furniture need not be removed, and the renovation can be completed in two days. Plushes, silks, satins, carpets, and fabrics of all kinds, as well as leather and all forms of seat-coverings, can be restored to their original color and freshness, no matter how faded and stained, and without the slightest injury to the texture of the goods. It is claimed that a railway-car can be renovated and put in thorough order, and made in every way

as good as new at less than one-tenth the expense of re-upholstering.

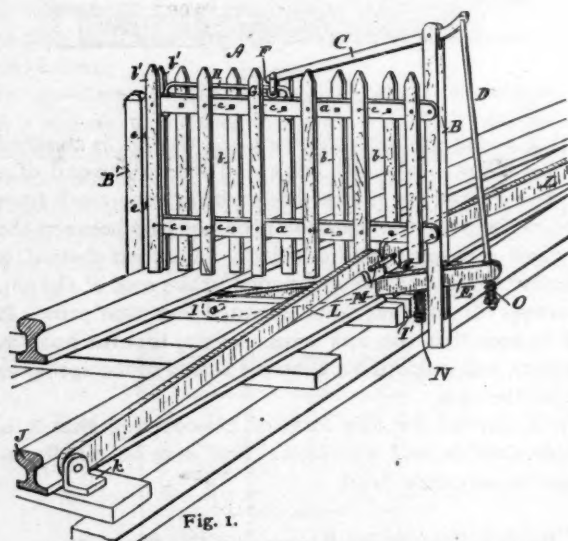
Railway-cars have been renovated by this process on the Pennsylvania, the Long Island, the New York, New Haven and Hartford, and other railways, with entire satisfaction, and a number of ocean steamers, including the *City of Richmond*, *City of Berlin*, and others, have also been renovated, and the work has received the endorsement of the officers of the vessels, including the Clyde Steamship Company, to whom the process has given entire satisfaction.

The process is now entirely controlled by the Oriental Restoring and Renovating Company, of 132 Broadway, New York City.

Patterson's Automatic Railway-Gate.

JAMES K. PATTERSON, of Crete, Nebraska, is the inventor of a new form of railway-gate, the construction and operation of which is herewith illustrated and described. The gate is designed to fall across the track at crossings in order to prevent cattle from straying on the lines, and should be a useful device especially in those sections where stock roams at large.

The invention provides a practical and reliable railway-gate adapted to be automatically opened by the weight of a train, and closed, mainly, by its own gravity; and consists of the construction, arrangement, and combination of parts, all as hereinafter described.



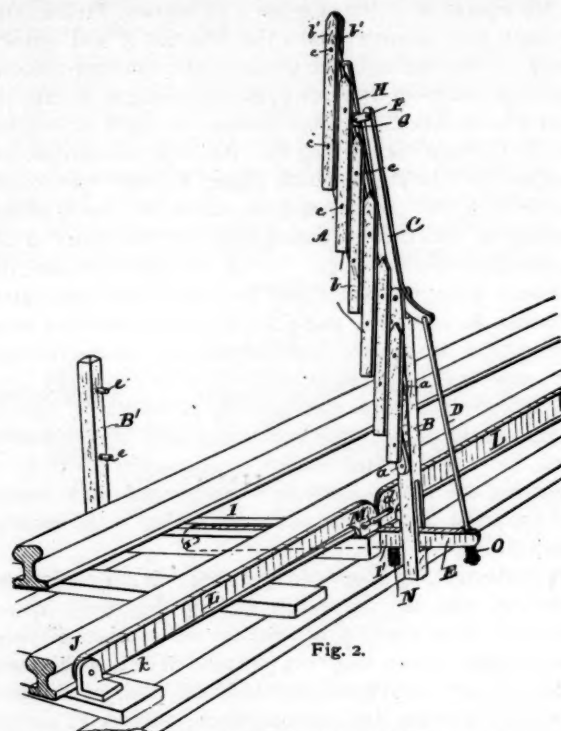
PATTERSON'S AUTOMATIC RAILWAY-GATE.

In the accompanying cuts, Fig. 1 is a perspective view of the device as it appears when closed across the track, and Fig. 2 a similar view of the gate as it appears when open.

A represents the gate. This is composed of the main bars *a a*, pivoted to the post *B*, and the pickets *b b'*, pivoted or hinged by bolts *c c*, to the bars *a a*, so that the gate may be opened vertically, as shown in Fig. 2. To the upper end of the post *B*, is pivoted the lever *C*. This is connected at one end by the connecting-rod *D*, to the lever *E*, while at its opposite end it is connected by the link *F*, and grooved roller *G*, to the iron *H*, secured to

the upper edge of the upper bar *a*. The lever *E*, is pivoted in the railway-tie *I*, which is slotted longitudinally, as shown at *I'*, to receive it.

To the outside of and parallel with the railway-rail *J*, are bolted to angle-plates *k*, the two levers *L L*, the adjacent ends of which rest upon the lever *E*, as shown clearly in the cuts. The upper edges of the levers *L L*, normally stand above the upper surface of the rail *J*, except at the plates *k*, where they are on a level with or slightly below the upper surface of the rail, so that the wheels of a railway-train in passing will run upon the upper edges of the levers *L L*, and gradually depress their adjacent ends, and through them depress the lever *E*, which in turn will



PATTERSON'S AUTOMATIC RAILWAY-GATE.

draw downward the short arm of the lever *C*, causing the long arm of this lever to open the gate by elevating it to the position shown in Fig. 2.

The levers *L L*, are caused to work simultaneously by being joined together by link *M*, made fast to one lever and entering the slot *d*, of the other. Beneath the lever *E*, is placed the spring *N*, that is compressed when the lever *E*, is forced downward, as described, and the reaction of the spring assists in closing the gate automatically after the train has passed the levers *L*.

Upon the rod *D*, below the lever *E*, is placed the coiled spring *O*, to cushion the downward motion of the lever *E*, and prevent the gate *A*, from being injured in opening, and this spring *O*, also cushions or prevents the gate from closing too suddenly. Opposite to the post *B*, is placed the post *B'*, which, in this instance, is provided with the pins *e e*, that enter between the two outer pickets *b' b'*, of the gate, and prevent the gate from having lateral movement.

It is claimed by the inventor that the device is simple, durable, and economical, while it efficiently serves the purpose for which it is intended.

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For Railway and other Signals

By means of this improved instrument, a full description of which was published in the November JOURNAL, the armature which carries the signal will be turned into one position whenever the circuit is closed, and automatically turned back by a suitable spring whenever the circuit is open, provided one Electro-Magnet is used; while if two Magnets are used the position of the signal will depend entirely upon the current that passes through either one of the Magnets.

The Magnet can also be placed in any position to operate all the different kinds of signals either in revolving or lifting.

It is especially adapted for use in railway signaling.

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GENERAL OFFICES THE ROTE AUTOMATIC BRAKE COMPANY,

MANSFIELD, OHIO, November 3d, 1884.

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

GENTLEMEN:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake*. This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer, or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be considered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner*, so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most thoroughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like people everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. HARTER, President.

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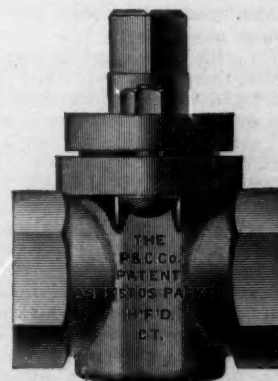
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